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Carib Cruises the West Indies

With 17 Illustrations and 2 Maps
40 Natural Color Photographs

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'Round the Horn by Submarine

With 16 Illustrations

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Fifty-six Pages of Illustrations in Color

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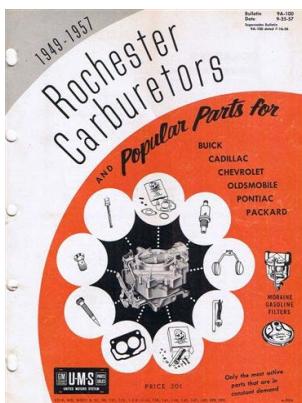
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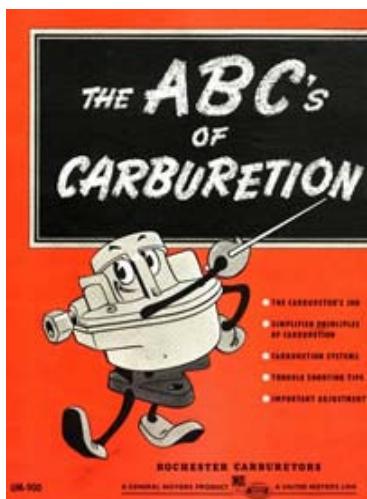
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THE NATIONAL GEOGRAPHIC MAGAZINE



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Carib Cruises the West Indies

By CARLETON MITCHELL

With Illustrations from Photographs by the Author

IT IS pleasant to have a dream come true, with reality more pleasant than the dream. During all the years I had been sailing, a favorite occupation from the time when small neighbors were shooting marbles, I had thought of a cruise through the islands of the Caribbean.

Whenever I came across a chart of the area I would run a finger along the dots that curve north from the shoulder of South America like a person admiring the pearls of a beautiful necklace. I could suddenly see a wake lying white against the blue water astern, feel hot sun and cooling trade wind on bare shoulders, and over the bowsprit visualize green palms and shadowed mountains.*

Sailing in the Wake of Columbus

At 4:40 on the afternoon of February 9, 1947, the dream began to come true. We dropped our lines at Port of Spain, Trinidad, and set sail for Annapolis, Maryland, nearly 3,000 miles away (map, page 5).

As we streamed the log off the Dragon's Tooth in the Boca de Monos, the narrowest and most easterly of the exits from the Gulf of Paria, *Carib* lifted to ocean swells. Here, according to the *New Sailing Directions for the Caribbean Islands*, published in 1818, was such "a perpetual agitation of the sea" that Columbus "called these passages *Bocas del Drago*, or Dragon's Mouths."

Conditions haven't changed. A mouth of the Orinoco River still drains a jungle rainfall into the Gulf, which discharges through the Bocas to meet the westerly current set up by the Northeast Trades. The collision of the two currents begets a steep, cresting sea.

"Just wait until you hit that sea off the

Bocas," Trinidad friends had said. "You'll find the going really rough."

It wasn't exactly smooth. Still, for a husky cruising yacht it was only moderately uncomfortable. Soon we could distinguish the row of smaller islands which run like stepping-stones to the mainland and mountains of Venezuela. To me Trinidad seemed just a chip off South America, separated by narrow passages.

Months of planning and work lay behind. In the fall of 1946 my wife and I had decided to send *Carib* to Trinidad on the deck of a steamer. We had lived afloat almost constantly for a year and wanted a spell at home.

Also, the trip to the Windward Islands in winter is not easy. One must make a long sea passage north of 30 degrees latitude to gain easterly with the help of westerly winds, or thrash to windward against the adverse Trades along the coasts of Haiti and Puerto Rico.

Most important, reducing our sailing distance by half gave us time for leisurely exploration of the islands.

Neither *Carib* nor ourselves were new to West Indian waters. Before the war I had made several long cruises through the Bahamas and Greater Antilles. The previous winter we spent five months circumnavigating Nassau the long way. Sailing southeast through the Bahamas to Haiti, we crossed to Jamaica, ran to Habana by way of the Caymans, the Isle of Pines, and the Yucatan Channel, and finally returned to Nassau via

* See "Southward Ho! in the 'Alice,'" by Henry Howard, in the NATIONAL GEOGRAPHIC MAGAZINE, March, 1938, and "Westward Bound in the Yankee," by Irving and Electra Johnson, January, 1942.



Carib Sails In Close and Salutes "H. M. S. Diamond Rock"

Here in 1804 Commodore Sir Samuel Hood "marooned" 120 British sailors. Hanging in clusters on the almost perpendicular slopes, they pulled up five cannon by hawsers—a sight which reminded a shipboard witness of mice hauling up a little sausage. For nearly 17 months the little band harassed blockade runners out of Martinique (background). As supplies approached exhaustion, the French attacked. With their last ammunition the defenders sank three gunboats, then surrendered with military honors. Unsinkable but immobile, the island is often called "H. M. S. Diamond Rock," as if it were a ship. British naval vessels always salute it on passing (page 9).

the Gulf Stream and Northwest Providence Channel.

Only Al Nelson, our professional, lacked offshore experience, but I had no misgivings about him—a confidence well justified, for he turned out to be an ideal shipmate.

Carib Named for West Indies' First Citizens

Our boat was named for the Indian tribe which dominated these islands, a warlike people who chose extermination to subjugation. Early books called them the Caribe Indians, or Caribbees; thence the Sea of the Caribbees, becoming Caribbean Sea.

Carib was built in 1939 as *Malabar XII*, the personal boat of John Alden of Boston, the dean of American yacht designers. She

is a jib-headed ketch, 46'8" overall, 34'6" on the waterline, has a beam of 12 feet and a draft of 7'4". I had purchased her in the fall of 1944 while I was still in the Navy. Naming her for the Caribbean proved that my dream of sailing tropic seas never faded.

After V-J Day she was readied for a long cruise: new running and standing rigging, hand-sewn sails, swing table, bunkboards, watertight covers—the list was long and expensive. But ocean cruising is only dangerous to unsuitable boats and poor equipment, sailed by an inexperienced crew. Size is a minor factor in safety: the lifeboat survives after the steamer has foundered.

As we plunged into the seas off the Bocas, I gave thanks to the United States Navy.

Had it not been for Capt. John B. Griggs, Jr., USN, Commander of the Naval Operating Base, it would have been difficult to rig the boat in Trinidad.

We were towed into a slip at Chaguaramas Bay to lie dwarfed by a floating drydock capable of repairing a cruiser while divers removed our cradle and derricks lifted the masts into position.

Trade Winds Blow True and Fair

The distance from Trinidad to Grenada is 90 miles, so we made an afternoon start in order to make a daylight landfall. All sailing in the West Indies is governed by the Trade Wind, which is practically always from the easterly quadrant; that is, somewhere between northeast and southeast.

We were lucky. The wind was due east, putting it nearly on the beam. *Carib* tossed her head with pleasure.

It is hard for a sailor to believe that a boat is an insensate thing of wood and metal: you come to believe that it has moods, personality, and even a mind of its own. On this passage *Carib's* spirit matched mine. Carrying full sail we boomed through the night, slamming into the seas to throw sheets of warm spray which glittered in the moonlight.

The powerful light on Chacachacare Island had hardly disappeared astern before we sighted the light on Saline Point, Grenada. At 4:40 in the morning, just twelve hours out, we hove to off St. George's Harbour to await daylight. We had made a fine passage. Distances between the islands are short; this was to be our last night run for three months.

Should your dream be the same as mine—and I really believe that to sail a small boat to tropic isles is the most common of human dreams—I can only wish you an introductory landfall identical to ours.

The morning sun first silhouetted, then gradually illuminated, Grenada, a golden light creeping up the mountainsides. Beyond water of an incredible blue lay white beaches and waving palms.

As we rounded a point guarded by a weathered fortress, the town sprawled around a semicircle of hills, looking like a stage set (Plate VI). Even today I feel that Grenada is the most beautiful of the Caribbees.

This has been called the "Spice Island." Quantities of cocoa and nutmeg are grown here. The air is frequently scented by cocoa beans drying in the sun (Plate VII). A planter told us of an amusing letter received from his agent in London: "Send us more mace and don't bother to grow so much nutmeg" it read—but mace is a fibrous tissue

which covers the outer shell of the nutmeg!

Most of the island is fertile, the hillsides and valleys covered with thick vegetation.

There is one exception, Saline Point, a flat peninsula to the southwest. The umbrella of clouds that usually hangs over the peaks of the Windward Islands skips this corner. Its annual rainfall is but 30 inches, compared with 70 inches for the town of St. George's. In 1946 Belvidere, only a few miles away, had an unusual rainfall of 156 inches.

Approaching Saline Point, our car, after passing lush greens, emerged from a rain curtain into a parched brown semi-desert (Plate V).

An excellent road belts the island. One day we drove to the town of Sauteurs to lunch with the Rev. Father Brian Proudman, the parish priest. During the war he had been an "aerial bishop," Royal Air Force slang for chaplain. Before his church lay a burial ground whose tombstone inscriptions date back 200 years. From the bluff could be seen the smaller islands of the Grenadines, purple outlines on the blue water (page 6).

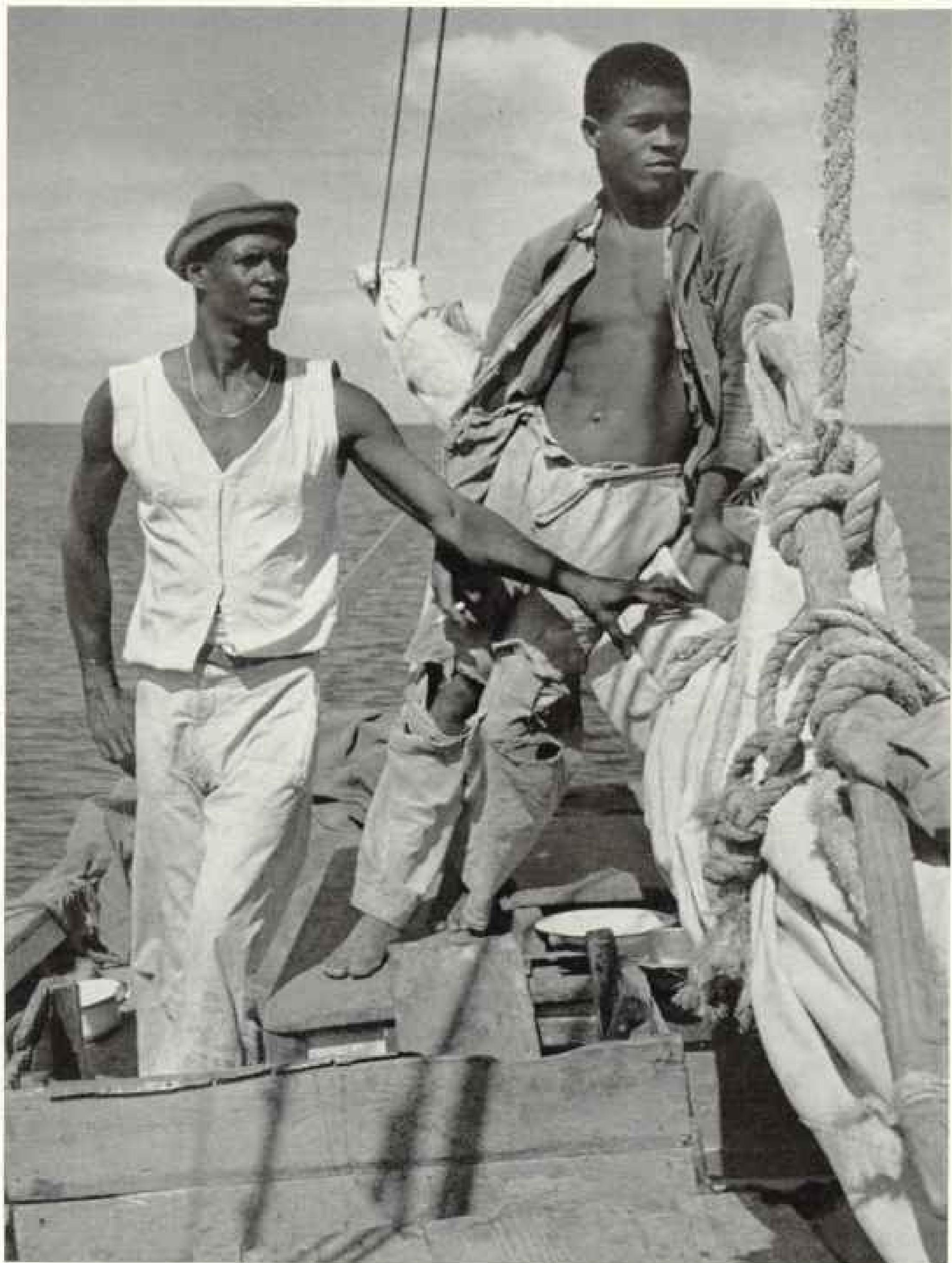
As we looked out, Father Proudman said: "This spot is called Le Morne des Sauteurs or 'Caribs' Leap.' In early days the island was in the possession of the French, who systematically slaughtered the Indians. The last remnants retreated here and held out for some time. Finally, the legend goes, the French discovered an unguarded path through a swamp; as they closed in, the Carib warriors threw their women and children over this cliff, then leaped after them."

Carnival in Grenada

We were fortunate to be in Grenada for Carnival, the big event of the year in the Windward Islands. Weeks of preparation culminate in The Day. Even before dawn bands begin to parade the streets, maskers falling in behind. In the afternoon the entire population of the island congregates at the race track near St. George's, and prizes are awarded maskers and musicians.

At the time of our visit a queen had been elected by popular vote; this year a king will be selected. Each may choose a consort. The costumes of the royal court were elaborate, and the monarchs presided with great poise and dignity (Plates X, XI).

In the selection of carnival dress, Grenadians let their imagination run wild. Costumes ranged from grotesque homemade masks and sackcloth capes to colorful dresses symbolizing the latest achievements of distant scientists, such as "Miss Plastic Cooker" (Plate IX, right).



White Sails and Ebon Sailors Carry on the West Indies' Interisland Trade

These two, part of a crew of five, man the sloop *Concordia*, out of St. Thomas, Virgin Islands. They and their fellows, trained in the Virgins' reefs and currents, are the peers of any seamen in the Indies, one of commercial sail's last strongholds. The author found their tiny vessel laden with 14,000 coconuts. The uncovered box lined with tin is the stove; a tiny charcoal fire is kept lighted in it, when weather permits.

Local merchants, knowing a pretty girl attracts attention, outfit attractive models with costumes that advertise their product. Prizes are awarded to the best "sandwich girls" (Plate IX, left).

"You'll catch it when you hit the sea off Kick 'em Jenny," Grenada friends told us. "It may be Diamond Islet on the chart, but you'll soon find why it reminds local sailors of a mule. Why, the last time we went by we had to shift into low gear and go down the waves on compression!"

So, as we powered with limp sails along the lee or western coast of Grenada, we expected the worst. Clear of David Point the breeze was no longer blanketed by the mountains, and we thankfully turned off the engine. Less than two hours later we swept by Kick 'em Jenny at seven knots, decks nearly dry, while Zib, my wife and our genius of the galley, served a hot lunch.

When *Carib* is under way in the open sea, cooking can go on in her little galley even when she "stands on her ear," as sailors describe a sharp angle of heel. The two-burner alcohol stove, hung on gimbals, swings freely so that as the ship rolls it remains comparatively stationary.

Though not a drop will spill, it takes a cook with "sea legs" to watch the pots when the motion is wild. Only twice during the whole passage did Zib find it too rough to cook.

Oysters Grow on Trees in Carriacou

In midafternoon we dropped our anchor off the dock at Hillsborough, Carriacou, to lie perfectly protected in a lovely curving bay. The sails were barely furled when a boat came



Drawn by Thomson Price and Irvin E. Allman

Carib's Route—3,000 Miles of Breeze and Adventure

The Caribbean! Maps can only hint at its fabulous discovery voyages, Indian wars, slave settlements, pirate raids, and naval battles. The author, sailing his ketch into obscure, volcano-sheltered harbors, visited the birthplaces of legends and captured little-known fragments of romance. How *Carib* toured the West Indies is shown in fuller detail by the map on page 7.

alongside to deposit a huge sack on our deck. "Compliments of Mr. Knight, the Commissioner," grinned the constable in the stern. "Mr. Comissiong in St. George's wired you were coming."

"What's in the sack?" I inquired.

"Oysters," he replied. "Oysters that grow on trees."

Next day we gathered some ourselves from the roots of mangrove trees that line a cove off Tyrrel Bay (Plate XIII). Although the oysters were small, the flavor was superb.

The Grenadines, about 100 islands and rocks, form a chain that extends some sixty miles between Grenada and St. Vincent. In



Grenada's Dead Rest Beside the Seaside Cliff Where Indians Committed Suicide 300 Years Ago

Rather than surrender to the pursuing French, the Carib warriors threw their women and children over and then jumped to their death from "Carib's Leap," Le Morne des Sauteurs, in 1650. The Reverend Father Brian Proudfit, a wartime "aerial bishop" with the RAF, looks over the scene (page 3).

spite of their charm they are rarely visited. A cruiser could enjoyably spend a winter exploring them, while the fishing and swimming are unsurpassed. From Curriacou we proceeded to Little Martinique, Little St. Vincent, Mayero, and Bequia. On the last, many trading schooners are built along the shore of Elizabeth Town, proud that it bears the name of the present British princess.

"Wait until you hit the sea in the Bequia channel," ran the refrain. Although the Anglican parson accompanied us and defied sailor superstitions by whistling, we were swinging at anchor in Kingstown, St. Vincent, in less than two hours.

We found we had sailed over waters which hide an unsolved mystery of the sea. Alan Gunn, Kingstown yachtsman, related the story

as he showed us the sights of the island.

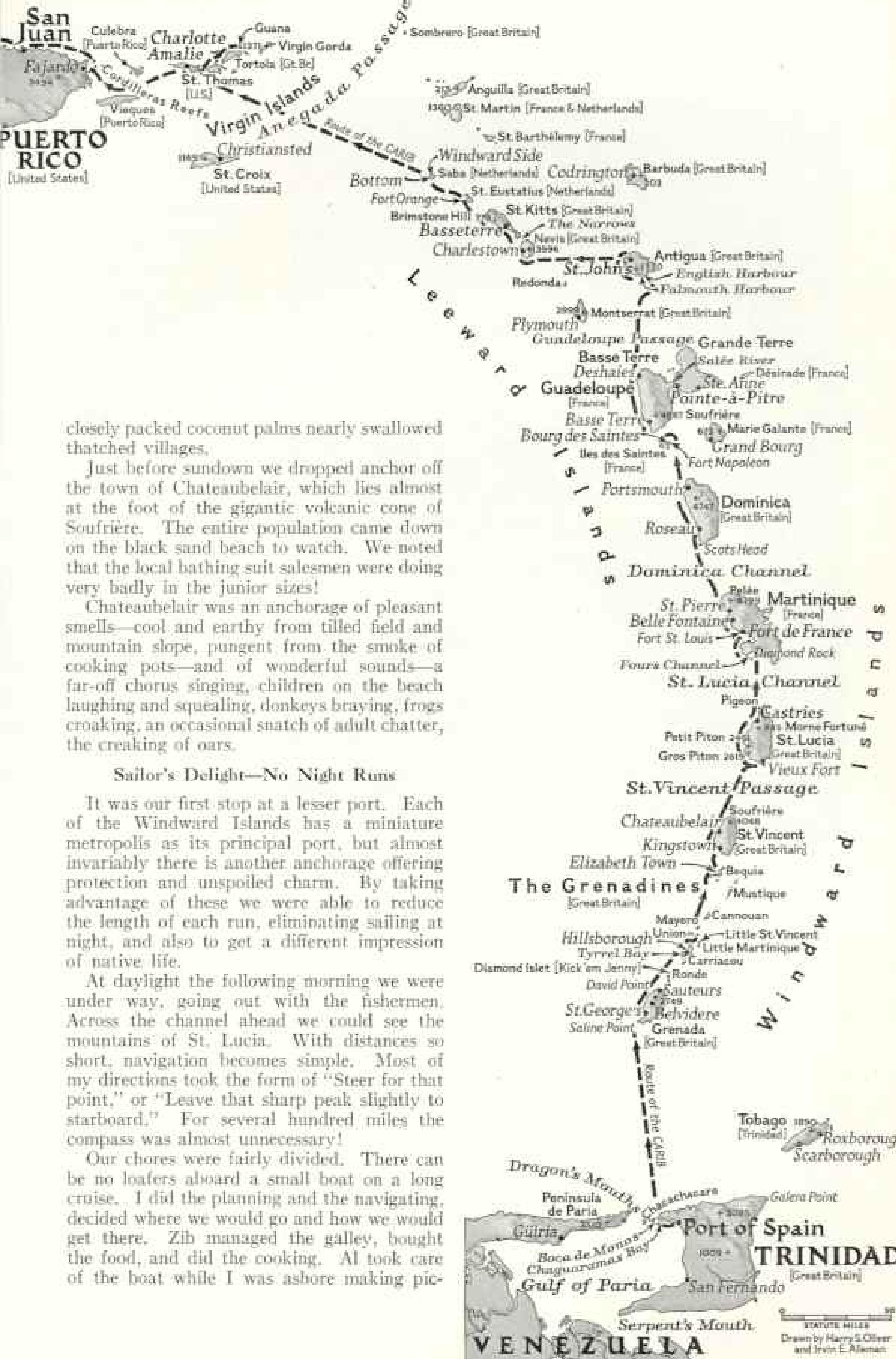
"The Diesel schooner *Island Queen* left Grenada with nearly 60 passengers and 11 crew, coming here on an excursion," he related. "She was nearly new—only two or three years old. During part of the run another schooner was within sight.

"Then somehow she disappeared. Completely disappeared. Not a trace was ever found: no wreckage, no bodies—nothing! It happened in 1944 when the U boats had almost stopped prowling; but a torpedoed vessel leaves floating debris, and someone in the Grenadines would have seen the flames or heard an explosion. In this case the schooner and everyone aboard just vanished."

From Kingstown we followed the west coast of St. Vincent, looking into valleys whose

San Juan
[United States]

PUERTO RICO
[United States]



closely packed coconut palms nearly swallowed thatched villages.

Just before sundown we dropped anchor off the town of Chateaubelair, which lies almost at the foot of the gigantic volcanic cone of Soufrière. The entire population came down on the black sand beach to watch. We noted that the local bathing suit salesmen were doing very badly in the junior sizes!

Chateaubelair was an anchorage of pleasant smells—cool and earthy from tilled field and mountain slope, pungent from the smoke of cooking pots—and of wonderful sounds—a far-off chorus singing, children on the beach laughing and squealing, donkeys braying, frogs croaking, an occasional snatch of adult chatter, the creaking of oars.

Sailor's Delight—No Night Runs

It was our first stop at a lesser port. Each of the Windward Islands has a miniature metropolis as its principal port, but almost invariably there is another anchorage offering protection and unspoiled charm. By taking advantage of these we were able to reduce the length of each run, eliminating sailing at night, and also to get a different impression of native life.

At daylight the following morning we were under way, going out with the fishermen. Across the channel ahead we could see the mountains of St. Lucia. With distances so short, navigation becomes simple. Most of my directions took the form of "Steer for that point," or "Leave that sharp peak slightly to starboard." For several hundred miles the compass was almost unnecessary!

Our chores were fairly divided. There can be no loafers aboard a small boat on a long cruise. I did the planning and the navigating, decided where we would go and how we would get there. Zib managed the galley, bought the food, and did the cooking. Al took care of the boat while I was ashore making pic-



Bottle and Goblet, Twisted Mementos of Pelée's Fires

St. Pierre's Volcanological Museum preserves these and other relics of the 1902 eruption. Iron nails are melted into an ingot. Books show every page charred. An electric bulb, fused into other objects, still lights (page 14).

tures, arranged for services, and did nearly all the maintenance.

We had no scheduled watches, but all took turns at the helm; the three of us had sailed together so much that orders were unnecessary. Usually Al and I were able to do the deck work alone, one at the wheel and the other handling the sails, but when it blew hard Zib took the wheel so that the two of us could wrestle with the canvas.

After a night at Vieux Fort, the most easterly point of the cruise, we slid along the leeward coast of St. Lucia to be awed by the Gros and Petit Pitons, among the most spectacular sights of the world (Plate XV).

St. Lucia has been called "The Fair Helen of the West Indies." Certainly few objectives

in history have occasioned bitterer struggles. Six times in the possession of the French since 1760, seven times retaken by the British!

Towering over landlocked Castries harbor is the Morne Fortune, whose ramparts were the key to the entire West Indies. Its slopes ran red with French and English blood.

But today the jungle encroaches on its cemetery, and the imposing buildings on its crest crumble in ruin (page 10).

On several afternoons, sitting with friends, we looked out over a tranquil plateau dotted with grazing sheep and playing children. I thought of that 24th of May, 1796, when the Royal Inniskilling Fusiliers stormed and took the Morne Fortune in the face of bitter French opposition.

So gallant was the regiment's conduct that Sir Ralph Abercromby, the British commander, ordered the regiment's own flag flown for one hour before the hoisting of British colors.

Near by is Pigeon Island, the site of Rodney's lookout during the blockade of the French fleet in Martinique. There I had my worst moments of the cruise: to reach the island I rented a native canoe.

From the first I noticed the boat was leaking, but assumed it was not too bad. Soon water was swirling around my ankles, and wooden objects were afloat in the bilge. One boy stopped rowing and began to bail in leisurely fashion. Suddenly it dawned that the water would sink us within minutes—and three precious cameras aboard!

Wedging camera bags on the seat, I knelt on the bottom and frantically scooped water with both hands while yelling at the two boys,

We crossed the channel throwing water like a fire tug while the one oarsman set a pace that would have won him a scull championship!

*Carib Salutes
Diamond Rock*

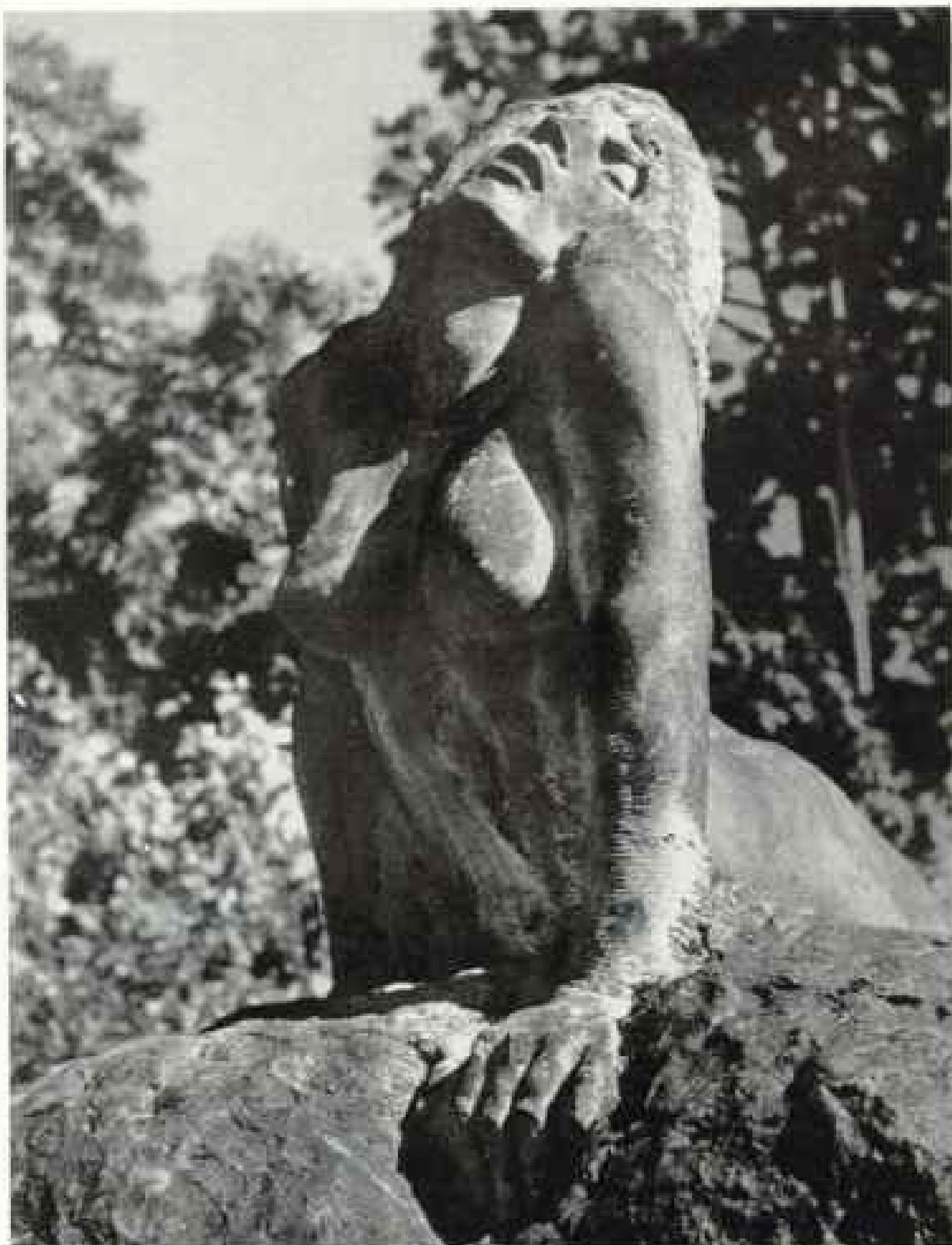
From Rodney's lookout tower I could plainly see famous Diamond Rock and the shore line of Martinique; less than twenty-four hours later we were approaching these landmarks in *Carib* (page 2).

Diamond Rock was the scene of one of the British Navy's greatest feats; its sailors have long called it "H.M.S. Diamond Rock." The British, under the command of Admiral Hood in 1804, found French ships were escaping through Fours Channel, which lies between the rock and the southwest tip of Martinique. So, one fine day, the Admiral laid his frigate, *Centaur*, alongside and sent five cannon and 120 men to the summit!

From their vantage point the brave group, under the leadership of Lt. James Maurice, R. N., made the French extremely uncomfortable for nearly 17 months!

In memory of those British sailors who hauled their cannon, ammunition, food, and even water up that steep precipice, British naval vessels still salute "H.M.S. Diamond Rock." The *Carib*, too, dipped her colors as she rounded the rock into Fours Channel.

We had heard many conflicting stories concerning the French islands. At the Embassy in Washington wartime restrictions were still in effect, and our passports had been visaed with the proviso that we would eat and sleep aboard our boat. With some uncertainty we warped our stern into the yacht-club dock at Fort de France.



St. Pierre, Reborn, Rises from Her Ashes

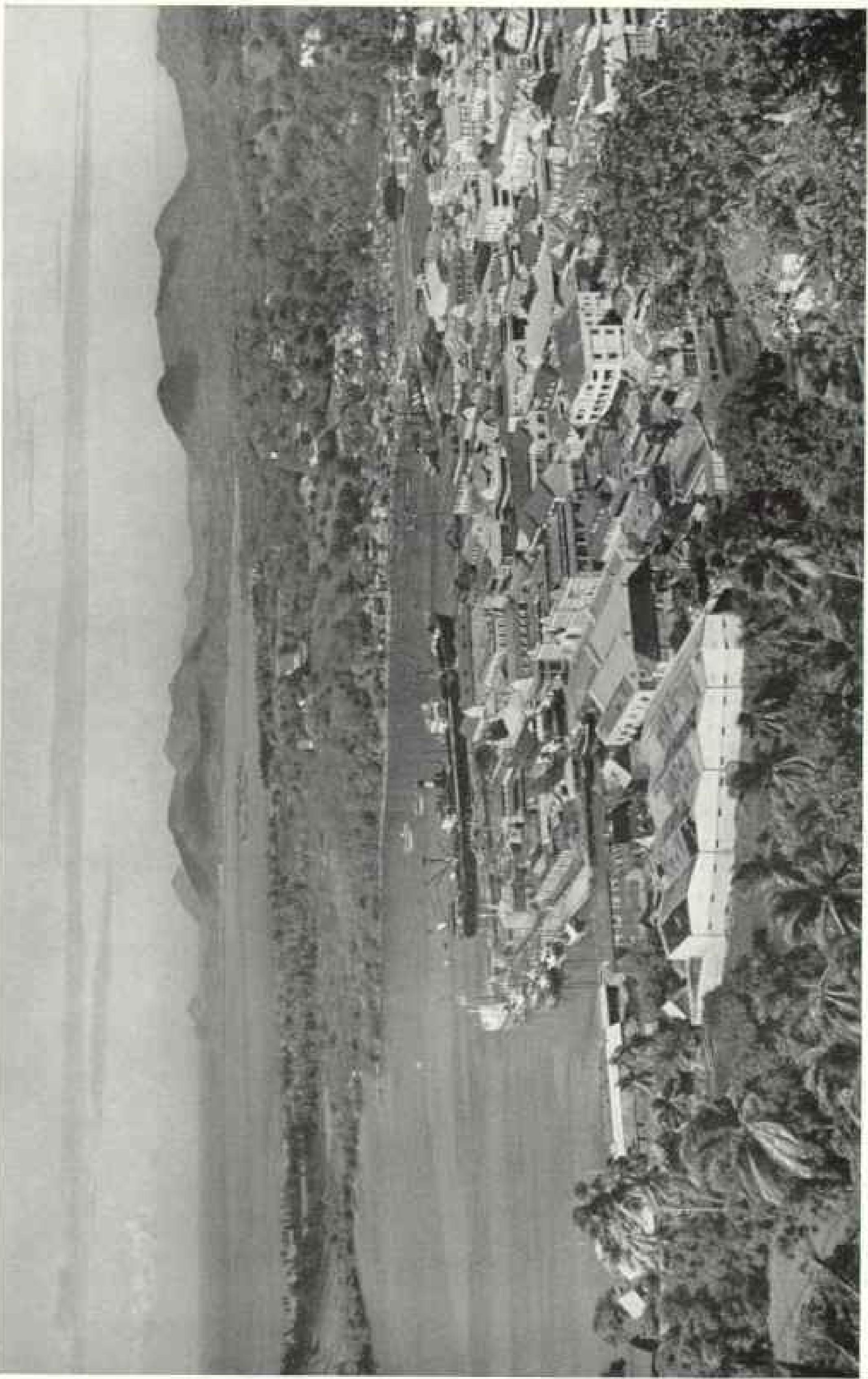
On May 8, 1902, a whirlwind of fire from exploding Mount Pelée snuffed out the lives of some 40,000 people in the Martinique port—every witness, in fact, except one criminal in jail and a few sailors on a ship. With this hopeful statue, the new St. Pierre challenges Pelée to do its worst (Plate XVIII).

We were not long in doubt. A crowd on shore offered advice and assistance, and *Carib* was soon boarded by two representatives of the club. "Welcome to Martinique," said one. "Please use this club as your home. Let us know if there is anything we can do."

A second later a man spoke to us from the dock, "Good afternoon," he said. "My name is Legros. Edgard du Prey cabled from New York to tell me you were coming. Will you and Mrs. Mitchell dine with me tonight?"

And so it began—the wonderful hospitality of Martinique. Nowhere have I encountered such friendliness and genuine desire to make the stranger welcome.

Our days on the island blur into one happy



Picture of Peace, St. Lucia Is the "Island of Strife." Cæsaries Hurho Chinked Hands a Dozen Times in French-British Wars

In 1742 a U-boat skipper, becoming impatient over two ships delaying their scheduled departure, sneaked into the harbor and torpedoed them; then he boldly surfaced and put out to sea. In 1778 some 1,400 Britons entrenched in the hills beat off three desperate charges by 5,000 French troops. From Pigeon Island, one of the distant peaks, Rodney kept watch on the Firoch fleet in Martinique. Carr (left) and the yacht Heloise rest beyond the big freighter.



One Glance Suggests a Teeming Canal Town in Java, but Fort de France Is the Little Paris of the New World
In the capital of Martinique even the darker citizens have a Gallic manner. The city cannot forget that Josephine, one of its daughters, became the wife of Napoleon and Empress of France. A statue honors her memory. This is the Madame River, whose companion is, logically, the Monsieur River.



Al Naton

"Laying Mash" and "Turkey Finisher" Shirts Are Carib's Souvenirs of Haiti

Flour and feed sacks command a good price all over the West Indies, for they can be made into garments. The skipper (left) and Henry Rigg bought theirs in the native market of Cap Haïtien.

recollection of places and people: dinner with the Garcins, where we laughed at our attempts with each other's language; lunch with Madame Clement at "Acajou," a two-century-old plantation house overlooking the family rum distillery; and a picnic high on the side of Mount Pelée with the Legros family, where our admiration was divided between the scenery and the flow of wonderful food from wicker hampers.

Hearn's Martinique of 60 Years Ago

One scorching noon in Fort de France the girls working at the Credit Martiniquais gave up their lunch hour to don traditional costumes and promenade in Alivon's garden. From old chests came forth beautiful dresses and jewelry to recreate a scene from the late eighties. Lafcadio Hearn's lines in *Two Years in the French West Indies* might have described the very girls I was photographing (Plate XVII).

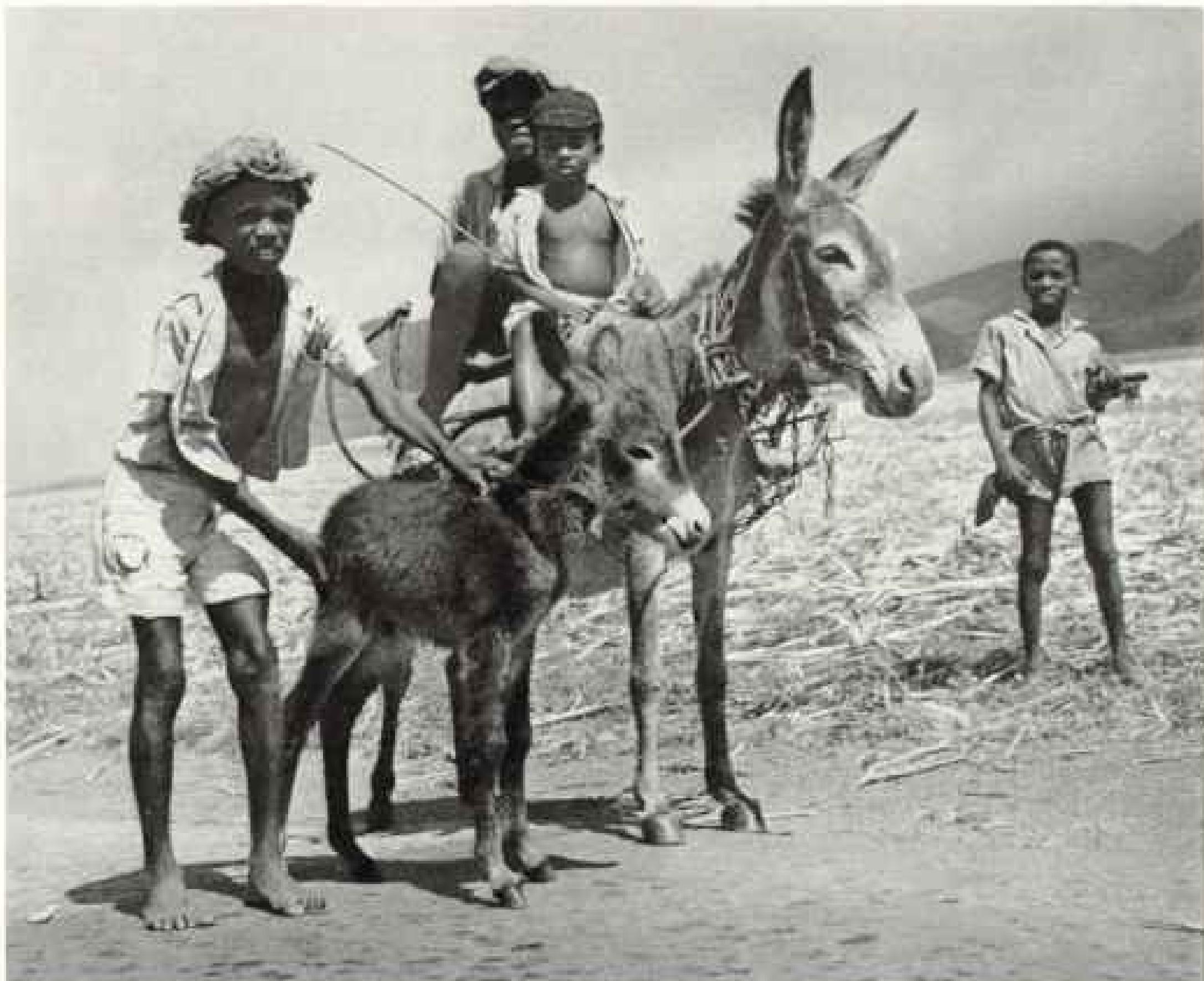
"Fantastic, astonishing—a population (out) of the Arabian Nights," he wrote. "Perhaps

the most novel impression of all is that produced by the . . . brilliancy of the women's costumes. Some of these fashions suggest the Orient: they offer beautiful audacities of color contrast. The full-dress coiffure is most striking. It is an immense Madras handkerchief, which is folded about the head with admirable art, like a turban, one bright end being left sticking up like a plume. This turban, always full of bright canary-color, is fastened with golden brooches.

"The dress is simple enough—an embroidered chemise with sleeves; a skirt or jupe, very long behind, but caught up and fastened in front and, finally, a foulard or silken kerchief, thrown over the shoulders. These are exquisite in pattern and color—bright crimson, yellow, blue, green, lilac, violet, rose—which vary astonishingly."^{*}

The island was hard hit by the war. There

* See "Lafcadio Hearn on the Island and People of Martinique," NATIONAL GEOGRAPHIC MAGAZINE, January, 1902.



Mother and Baby Tour St. Kitts Three Days after a Fuzzy Advent

Patient donkeys, beloved by children, do a large share of the West Indies' work. This mother wears a cradle for carrying sugar cane. Chaff from harvested stalks litters the field.

was a tragic political division, and our naval blockade imposed real hardship. Today trade has been largely reestablished, and prosperity is returning; there are few shortages, but prices are high and the black market flourishes despite rigid currency controls.

In the early days of the war the French aircraft carrier *Béarn*, stationed in Martinique, was a source of concern.* Adm. Georges Robert, in charge of the military forces on the island, chose to follow the orders of the Vichy regime, and many United States officials were perturbed by this loophole in hemisphere defense.

A huge majority of the citizens, however, were not in sympathy with Vichy, and many young men made the hazardous passage across to St. Lucia in anything that would float to join the Allied forces.

I saw evidence of the bitter rift that existed in Fort de France. In the office of Mr. Emmanuel Rimbaud hangs a framed copy of an order dated June 24, 1943, and signed by a

Robert minion, which commits him to jail for being "dangerous to the national defense and public security."

The room was the secret meeting place for members of the Resistance, and its walls are covered with mementos. One is a flag, torn down and trampled in the garden on the day he was jailed, which was triumphantly hoisted and kissed by 10,000 when he was freed.

Many remember Martinique as the birthplace of the Empress Josephine, wife of Napoleon. A contemporary of hers, the Sultana of Turkey, was also born there. History has few stranger stories than these two women of humble origin following their destiny from this tiny island to two of the most brilliant courts of the world.

We were able to leave only by convincing ourselves that someday we would return. Finally *Carib* slipped her lines and sailed out

* See "Martinique, Caribbean Question Mark," by Edward T. Follard in the NATIONAL GEOGRAPHIC MAGAZINE, January, 1941.

around Fort St. Louis, just as the fleet under de Grasse had done 165 years before. Fortunately for us no Rodney was watching from Pigeon Island, waiting to pounce.

The gentlest of breezes fanned us out of the magnificent bay and along the western coast, where we paralleled the coastal road. The slopes of Pelée dominated the landscape, and for a miracle its peak was almost clear of clouds (Plate XVIII).

From the water the town of St. Pierre looks like most other West Indian towns of similar size. None of the damage caused by the eruption of Pelée is immediately visible. But ashore it is different: the passing of 45 years has softened, not obliterated, the scars. Here stands a windowless house, a mere shell of stone and mortar; there, a weed-covered plot with a heap of rubble in the center.

Pelée Leveled St. Pierre Like Atomic Blast

I was struck immediately by the curious parallel between the tragedy of St. Pierre and the holocausts of Hiroshima and Nagasaki.

A contemporary report on the eruption by Robert T. Hill in the NATIONAL GEOGRAPHIC MAGAZINE, June, 1902, reads like the eye-witness accounts of the destruction of the Japanese cities by the atomic bomb.*

When Mount Pelée erupted on May 8, 1902, an awful blast of flaming gases and super-heated steam suddenly burst from the volcano's side and engulfed the town. Its force leveled whole streets of houses. Bodies found among the ruins were naked. Clothing was burned and blown away. Fires broke out at numerous points. Except for one criminal in a tiny hillside jail, who was burned so badly that he died a few days later, the entire population of some 40,000 perished within seconds.

Not one thing remained alive: animals, birds, trees, and flowers were reduced to gray ash.

Of 18 ships anchored in the harbor, only the British freighter *Roddam* remained afloat, and she was heavily damaged.

In the Museum are relics testifying to the frightful heat: blobs of nails fused into one mass; perfume bottles altered in shape but with liquid sealed inside; cinders that were once books or packages of food (page 8).

Before leaving Fort de France we had listened to the same old story. "Watch out for that Dominica Channel," warned Roy-Camille of the sloop *Enchantress*. "I've cruised these

*See "The National Geographic Expedition to Martinique and St. Vincent," NATIONAL GEOGRAPHIC MAGAZINE, June, 1902, and "Report by Robert T. Hill on the Volcanic Disturbances in the West Indies," July, 1902, accounts of The Society's first expedition, undertaken within five days of the report of the St. Pierre disaster.

waters all my life, and the others are nothing. But that Dominica Channel, phew!"

Although it was slightly rougher than the others, we had a glorious sail, occasionally putting the rail down but always coming closer to the mountains we could see through the spume to leeward (Plate XXIV).

We had our heaviest wind after we had rounded Scots Head and were in the shelter of the land. For a while we lay almost becalmed, even our flags drooping. Suddenly we heard a faint moan towards shore. We saw a line of tiny, creaming wavelets advancing at high speed.

The wind hit like the pressure of a heavy hand and forced *Carib* down on her side until the liferail stanchions were partially buried.

It was a "white squall"—one of those dread gusts which, rushing down the valleys, were the terror of the old square-riggers. Sometimes these heavily sparred ships would not recover from the knockdowns, especially if the cargo shifted. But a modern yacht of proper design is in no real danger.

On arriving at Roseau we left poor Al to watch the boat while we took to the hills. This roadstead was one of our roughest anchorages; the ship rolled continuously. With a feeling of guilt, we joined our friend, John Archbold, at his plantation in the mountains. He met us in a Ford touring car whose doors automatically flew open at every bump, and in it we began to climb the Imperial Road.

Dominica—Skipper's Favorite Isle

I have tried to avoid superlatives in describing the islands, especially as there are amazing differences between them and each seems to excel in some way. Still, I feel justified in describing Dominica as the most lush, most rugged, and most primitive of them all.

No power of pen or lens can convey the luxuriance of the foliage or the wonderful shades of green. The vegetation lacks the oppressiveness of a tropical jungle, and the mountains, crisscrossed with ridges and valleys running in every direction, seem like a confused, tide-tipped sea solidified.

It was a delightful change. In the mornings we sat on the terrace writing and looking far down the valley to the sea. At noon there would be a swim in a bubbling mountain stream shaded by arches of bamboo. In the evenings there were comfortable chairs and easy conversation.

Dominica's people seem always busy—managing citrus plantations, writing, growing things not native to this hemisphere, extracting drugs from medicinal plants, building furniture from local woods, and experimenting



Stone Lizard, Rearing an Inquisitive Head Seaward, Gives Guana Island Its Name

Guana (short for Iguana) is one of the 100-odd Virgin Islands. Columbus, discovering the group in 1493, named them in honor of St. Ursula's legendary 11,000 female companions massacred by the Huns. On this island an American family makes its home (page 59). Water comes from a cistern built in 1740.

with new methods of cultivation. And all this on an island which has no sawmill, practically no roads, and no regular steamship or airplane service.

Eventually John had to return to the States, and we went "home" to the *Carib*. After an overnight stop at Portsmouth, on the northern end of the island, we headed for Iles des Saintes, a group of tiny islands which nestle close to Guadeloupe.

Again we were paralleling the course taken by de Grasse in 1782. It was a lazy day.

As Zib sat in the cockpit shelling pigeon peas, I told her the story from the wheel: "The British had a score to settle with Admiral de Grasse. He had blocked their attempts to reinforce Cornwallis before the Battle of Yorktown, and that defeat had lost the American War of Independence.

"Besides, the French were challenging the British as a naval power—they were so cocky that it's said a wealthy Frenchman paid off Rodney's debts so he could command and the French wouldn't miss the glory of beating Britain's best admiral!"

"Theoretically, the French had a slightly stronger fleet. As de Grasse left Fort de France, the British followed from St. Lucia. Rodney caught up about here. For two days

he maneuvered, looking for an opening. It came on April 12. It was a real slugfest match, but little by little the French guns were silenced. This water was red with blood and dotted with smoking hulks and wreckage.

"Finally de Grasse struck his colors, and the British won the Battle of the Saintes, domination of the West Indies, and mastery of the seas! Rodney was a tough old boy!"

The Iles des Saintes are quaint and charming, and the anchorage off the principal town, Bourg des Saintes, is well sheltered (Plate XX). On going in we found the water so clear that the sand seemed just under the keel. Al made a cast with the lead to report: "No bottom at seven fathoms!"

On leaving, we crossed to Basse Terre, Guadeloupe, in less than three hours despite a light breeze. To our surprise we were met by the harbor master, who pointed out the best berth and assured us that no further formalities were necessary: Bill Christensen, at that time U. S. Consul in Fort de France, had sent a telegram to the Governor.

Next day we hired a car for the drive to Pointe-à-Pitre, the principal commercial city, and I had one of my daily lessons in geography. The island of Guadeloupe consists actually of two islands: Basse Terre, to the

west, of volcanic origin and extremely mountainous; and Grande Terre, to the east, of limestone formation and very flat in comparison.

Soufrière, dominating Basse Terre, is an active volcano which towers to 4,867 feet, while the highlands of Ste. Anne, on Grande Terre, rise only 375 feet above the sea. The two are divided by the Salée River. It is amazing to see such completely different landscapes on either side of a narrow ribbon of water.

Food Plentiful in Guadeloupe

Basse Terre had one of the best native markets we found on the trip. Each town on every island has an area reserved for produce brought in by the neighboring farmers.

By daylight women are squatting behind piles of tomatoes, plantains, yams, pigeon peas, limes, coconuts, breadfruit, papayas, oranges—everything that grows in the incredibly rich soil. Other women sell cakes and little sugar patties, medicinal herbs, eggs, bits of cloth, papers of pins, tin cups, pottery.

Underfoot dart children and dogs, while chickens tethered by one leg range as far as their cords allow. There is a confusion of noise and color and odor, but everyone is good natured and enjoys the bargaining. In such markets, Zib, as cook, and I, as basket carrier and assistant haggler, did nearly all our shopping.

Food was not a problem. Most staples, canned and otherwise, were shipped down aboard *Carib* from New York. But they would have been available locally, although at a much higher price. We were able to buy vegetables, fruit, bread, and eggs at nearly every stop. Meat was scarce, as was—surprisingly enough—fish.

Water was our only real headache; except for that taken on at U. S. "destroyer deal" bases, we could trust it nowhere. All taken aboard was laboriously boiled and bottled before drinking. Ice, that manna of the Tropics, was available in large towns.

After a rainy night in the harbor of Deshaies, where we stopped to break the run, we set a compass course of NxE. For the first time since leaving Grenada our next objective was not in sight.

For the first time, too, we were besieged by squalls. All during the morning black clouds made a ring around us.

As one series would disappear to leeward to hide the mountains of Montserrat another would come drifting in from the open Atlantic. At one moment we would be wallowing in a nasty sea with no wind to fill our canvas; at

the next, standing by the main halyard to douse sail if there was too much. Such conditions are trying for a small crew.

Shortly before noon the coastline of Antigua showed clearly, and the wind steadied and freshened from the southeast. We closed fast, trying to identify the entrance to English Harbour—a place so well sheltered that it had once been the hurricane refuge of the British fleet.

Closer and closer we came to a wall of sheer rock. A sea had made up and was breaking heavily all along the coast. I read and reread the *Sailing Directions for The West Indies*, studied the chart, and peered through binoculars. I could see no entrance.

Suddenly we were in too close, and there was a scramble to get in the mainsail. A squall hit, we shipped a heavy dollop from the backwash off the rocks, and I hurt my hand on a reef cringle as the sail slatted—getting three misfortunes over in a hurry.

With forestaysail and mizzen sheeted in flat we were virtually hove-to, but still I couldn't see the entrance. While the look of the coast seemed to match the description, we couldn't be sure. And you don't run a boat towards a lee shore unless you are really sure!

So we bore off and ran downwind about a mile to look into neighboring Falmouth Harbour, made our check identifications, and beat back to our old stand. Even then the entrance was hidden.

But this time we confidently sailed towards the rocks and suddenly looked into the entrance, followed it around an S-turn, and found ourselves in the best anchorage I have ever seen (page 37).

To port lay the remains of the old dockyard, formerly commanded by the immortal Nelson himself, to starboard a house once occupied by the Duke of Clarence, afterwards King William IV.

Carib Moored in a Giant Cup

We were in a giant cup, the surrounding hills topped by weathered fortifications.

For a couple of days and nights we swung around our anchor in perfect peace despite the fact that technically we were lawbreakers, having come into a place not legally a port of entry. But the authorities were lenient and gave us clearance, and Chief Magistrate Charlesworth Ross appeared with then U. S. Vice Consul Nicholas Fuller, not to censure but to welcome and invite us to a picnic.

The buildings of English Harbour are in surprisingly good repair, and it is unfortunate that funds do not exist for their preservation.



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Photograph by Carlton Mitchell

Like Columbus' Caravels, *Carib* Runs down the Trade Winds, Exploring the West Indies

On her 3,000-mile voyage from Trinidad to Maryland, the ketch cruised the Spanish Main, followed the wake of early navigators, and visited storied islands where long-forgotten battles were fought and pirates roved. Aeolus, god of winds, smiled, for *Carib* sailed warm, strait seas with mostly fair breezes.

Her Rail Buried, *Catib* Drives Through the Chop off Boca de Munos, One of the Dragon's Mouths—Trinidad

III
Carib Wears a Wooden Cradle but No Masts, At Port of Spain She Swings into Deep Water



Kodachrome by Carlisle Mitchell

Laura, the Man-hating Parrot, Poses with a Distrustful Eye on the Cameraman
A hotel's pet at Basseterre, St. Kitts, Laura seldom misses an opportunity to sneak up on a trousered leg and bestow a stealthy nip. For women, such as the hotel maid, Laura willingly "sings."



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Kodachrome by Carlisle Mitchell

A St. Lucia Fisherman Weaves an Intricate Maze Trap for Unsuspecting Fish
Bamboo poles (right) are sliced into thin strips (below). The completed labyrinth is easy to enter, but hard to escape. Baited with scraps and weighted with stones, the trap is thrown into the sea.

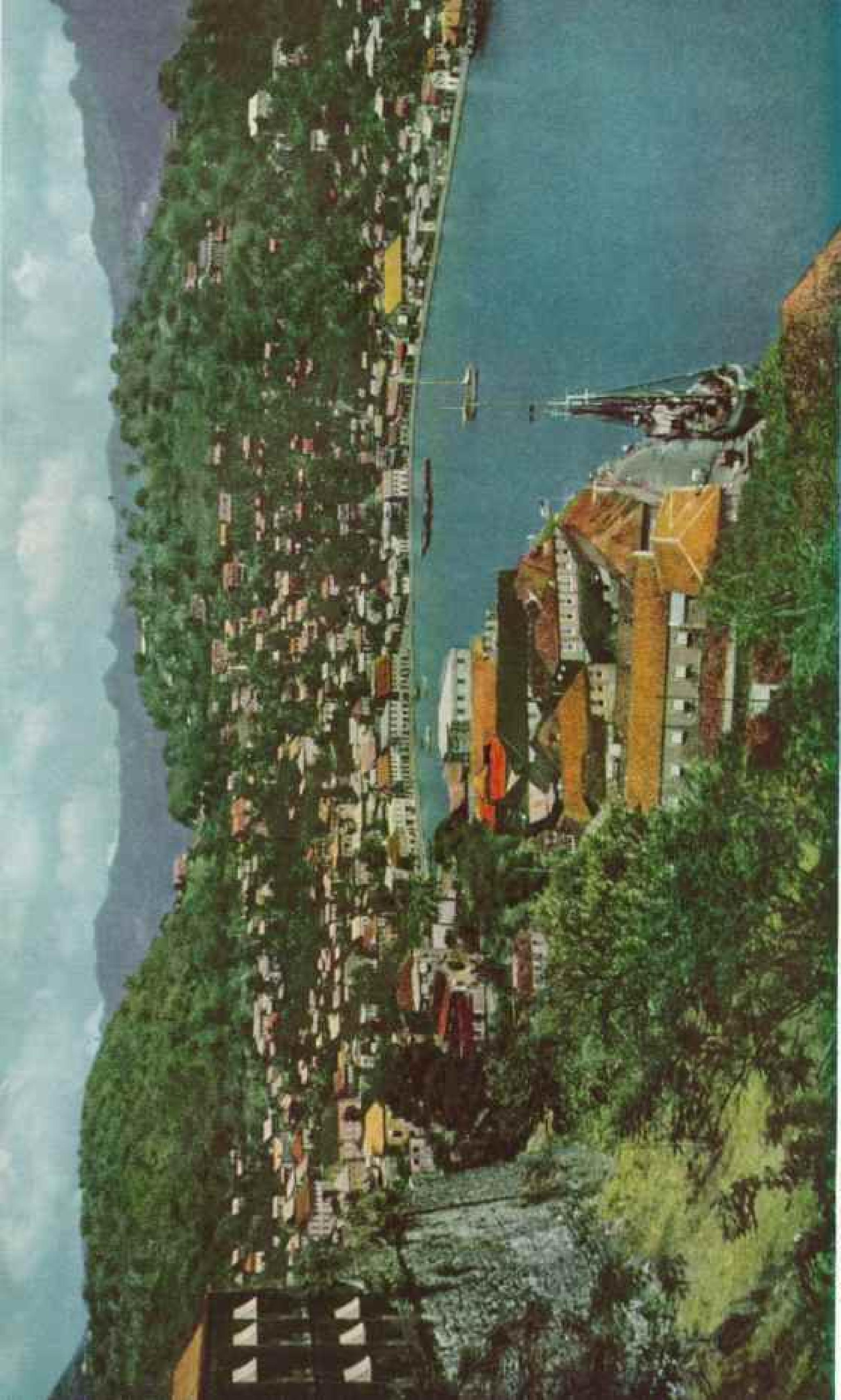


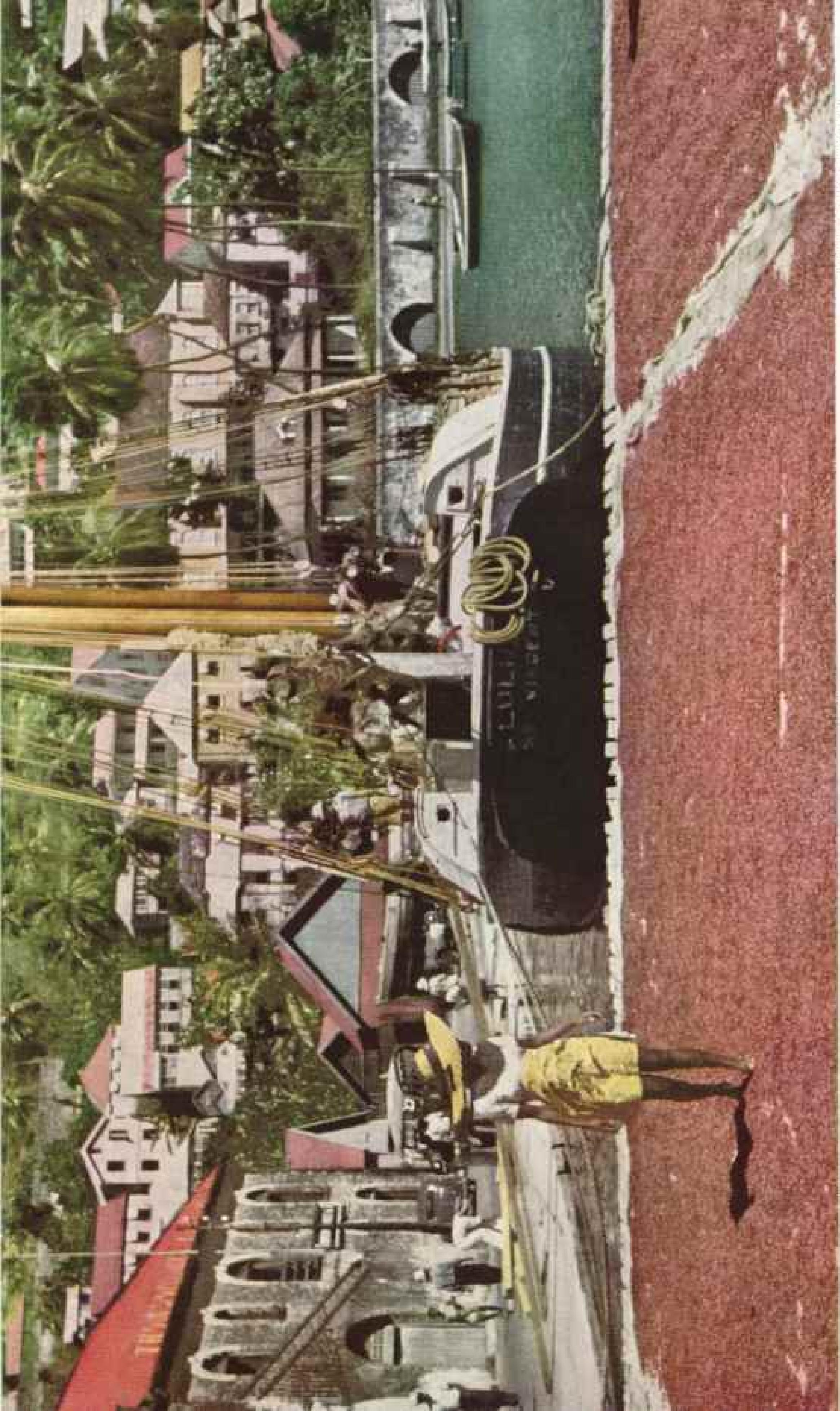
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Photographs by Carlton Ward Jr.

On the Lush Island of Grenada There Is a "Desert" on Which Giant Cacti Thrive

Mountains on the island's windward side a few miles away may catch 156 inches of rain, but flat Saline Point gets only 30. Sheep (right) graze on a hardy imported grass. Two models indicate the stature of this *Cereus giganteus*.





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VII

Editorial by Carlton Mitchell

Chocolate Scents the Air along St. George's Quay Where Cocoa Beans Dry in the Tropic Sun—Grenada

Grenadians Rush to Market to Buy a Slice of Dolphin Just Brought In by the Sailing Canoe

Though water lies everywhere, the island is shy of sea food. When a successful fisherman sells it, he finds no lack of customers.

© National Gypsum Company
Miss Muffet in a Plastic Dress Eats Curds from a Plastic Bowl

IX



© National Gypsum Company

Grenada Carnival Girls Wear Bottle-top Hats Advertising Lotion



King and Queen for a Day Lead Their Subjects in Grenada's Carnival Parade. She is the popularly elected monarch; he her chosen consort. Next time a king will be elected; he will select a queen.



© National Geographic Society

Editorial by Carlton M. Mitchell

Bandsmen Beating Steel Drums Assault Grenada's Ears with Deafening Shock Waves. To achieve a musical effect, the "Hellcats" temper their drums with heat treatment. Another "steel band," using parts of old automobiles as instruments, achieves weird effects.



© National Geographic Society

Photograph by Carlton Mitchell

Singers Serenade St. George's Hotel Guests, Who Toss Coins from the Balcony

Grenada's troubadours, some in masks, wear scarves flowing from floppy straw hats. Guitars provide the music. Hotel servants, peeping from windows, enjoy a free show.



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XII

Reproduced by Courtesy of National Maritime

Like Coach Dogs, Porpoises Leap Ahead of *Cornelia Bowesprit*. Never Tiring of Play, They Frequently Circle the Ship

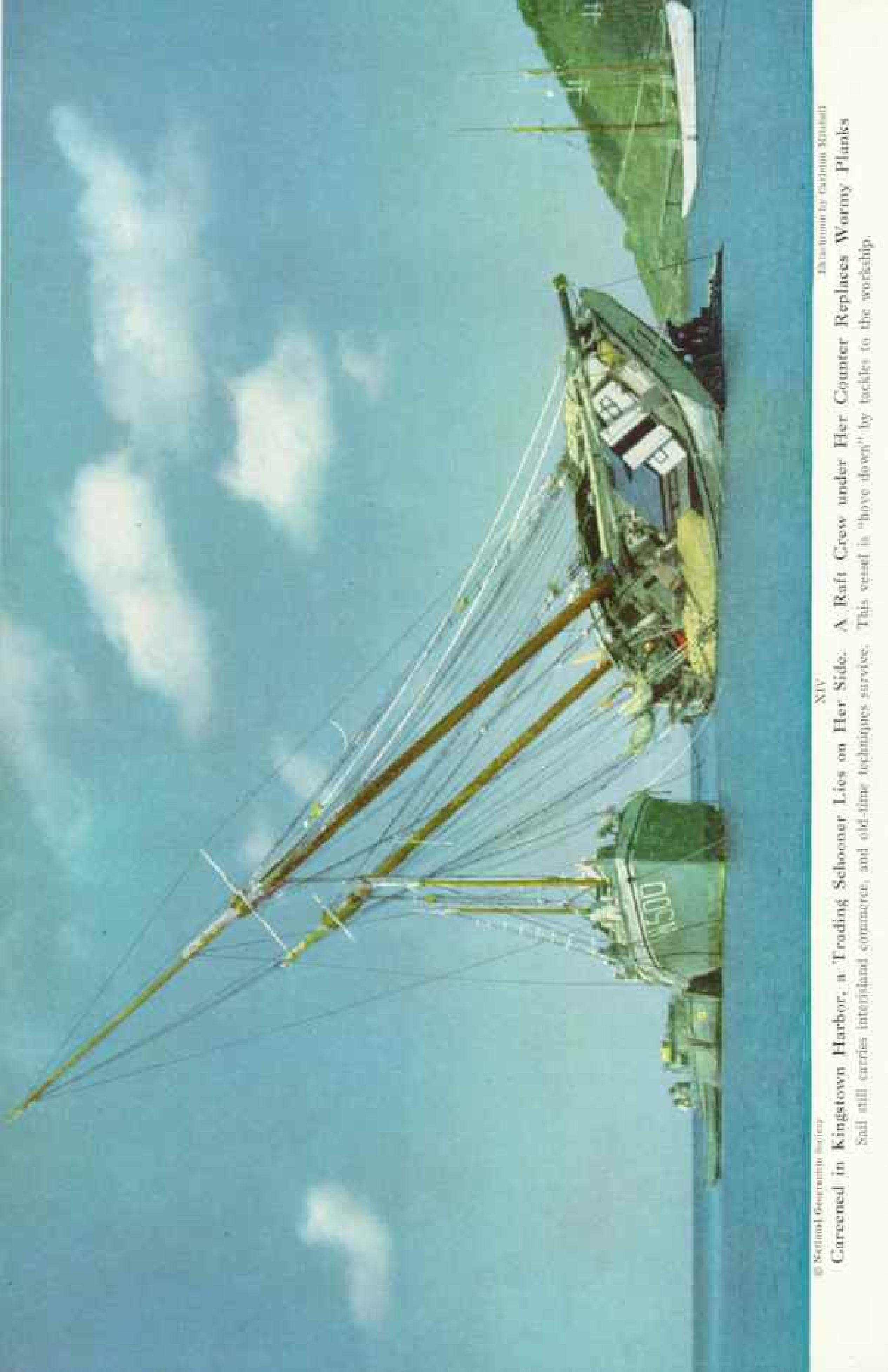
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On Carrion Island, the Grenadines, Oysters Grow on Trees. They're Small but Delicious
Oysters cling to the tentaclelike roots of mangroves that fringe a tiny lagoon off Tyrell Bay. Men harvest the bivalves by lifting a roof, cutting off the largest clumps.

Photograph by Carlton M. Smith

XIII





Painted by Captain Strahan
XIV

© National Galleries Society

Curroed in Kingstown Harbor, a Trading Schooner lies on her side. A raft crew under her counter replaces wormy planks
Sail still carries interlaced commerce, and old-time techniques survive. This vessel is "bove down" by tackles to the workship.

Petit Piton (Little Peak),
Mariners' Landmark for
Generations, Beckons *Carib*
to St. Lucia

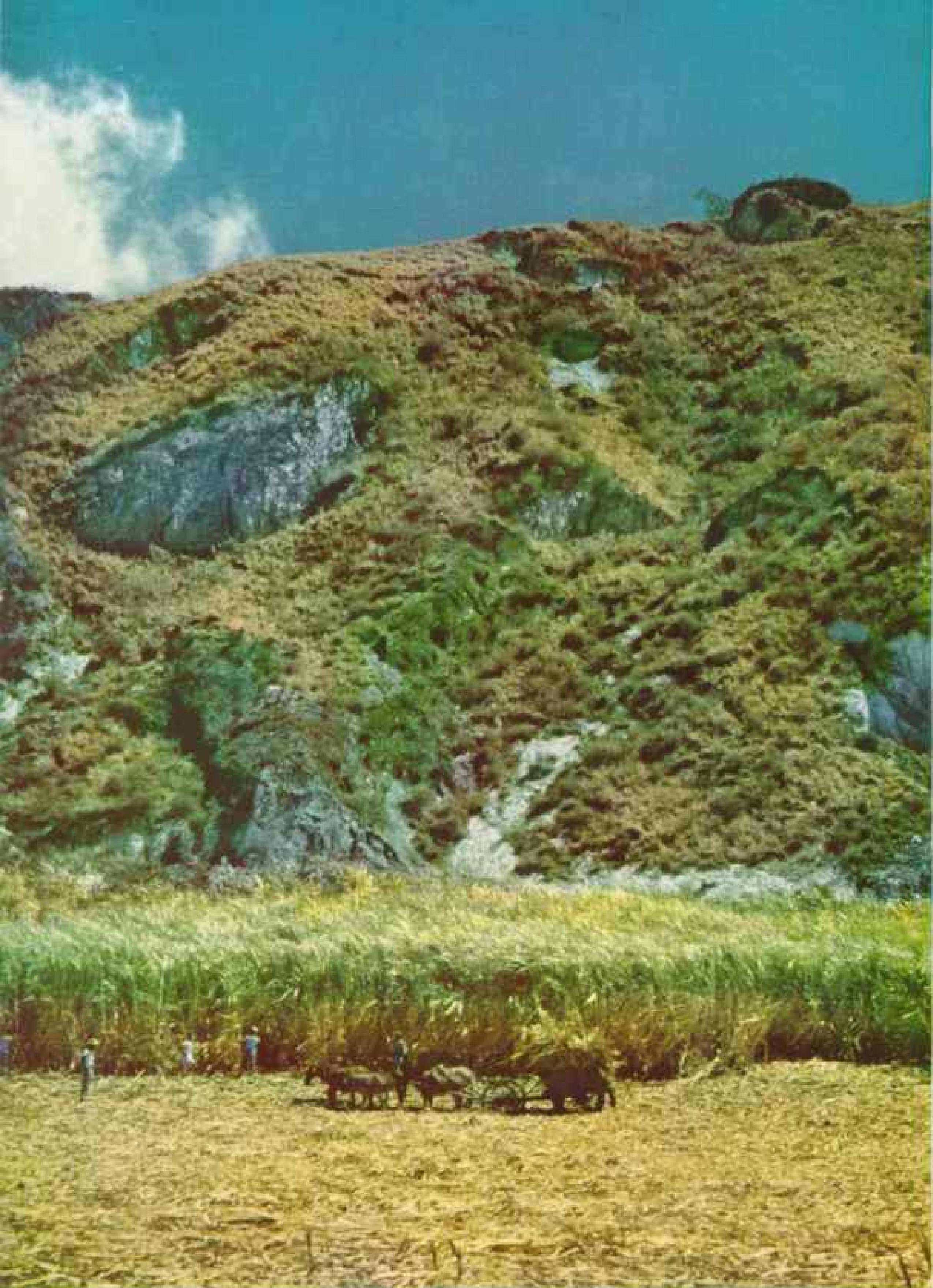
Here two neighboring mountains,
one out of sight to the right, are the
immortalized spines of lava that cooled
in two volcanic vents.

Petit Piton's steep 2,461 feet went
unclimbed until 1878, when a French-
man gained the summit. Its taller
but less precipitous neighbor, Gros
Piton (2,619 feet), is an easier climb.
Tradition says that long ago three
English sailors set out to scale Gros
Piton. As watchers followed them
with glasses, they were soon to fall,
one by one, presumably victims of
the deadly fer-de-lance, a snake that
once infested St. Lucia.

In this lee cove, the mountains
muffled out the breeze and Carib,
her sails furled, resorted to her em-
prise. Spare fuel rises in this beside
the tall. The green starboard run-
ning light (an rigging) is for night

use.

© National Geographic Society
Photographs by Frederic Wilson



© National Geographic Society

Illustration by Curious Mindell

St. Kitts's Crop Is Sugar; Tall Cane Grows Right Up to Mountain's Craggy Brow
Planters cultivate every available inch. Were the slope beyond less steep, it too would be farmed. Here a four-horse team carts the stalks away to the mill's narrow-gauge railway.

I know of no other place in the world having a closer connection with the vanished age of sail.

Here are the old careening capstans, the sail lofts, the small-boat landings, the warping rings—nearly everything required to maintain a frigate far from home. It is worth a pilgrimage by any lover of the sea and ships.

On our way around to St. John's, the principal port, we found ourselves skirting outlying reefs for the first time on the passage. The harbor itself is large but shallow. There are fertile plains covered with sugar cane, and many magnificent swimming beaches. During the winter months the climate is nearly ideal.

Nevis—Birthplace of Alexander Hamilton

From Antigua, Nevis—and "the course, west!" Although less than a fifth of our distance lay behind we had the feeling, as we rounded the bend, of being on the homeward leg (chart, page 7).

Due to a late start it was dark before we arrived off Charlestown, to creep close to a dim red light on the jetty. We anchored in the center of a fleet which turned out to be sailing barges used for ferrying sugar cane to St. Kitts. Although much cane is grown locally, there is no sugar mill.

Nevis consists of a single volcanic cone thrusting out of the sea, its gradual slopes patterned by fields, its peak nearly always lost in the cloud cover that inspired Columbus to name the island for snow. First settled by English colonists in 1628, it was ravaged repeatedly by the Spaniards and French.

Here Alexander Hamilton was born. Captain Nelson of His Majesty's Ship *Boreas* married the widow Nisbet, and the wealth and fashion of the West Indies met at the old Bath House Hotel to "take the waters."

Travelers were writing of the curative value of these thermal springs as early as 1625, and we were able to give them a try, although they are not now open to the public.

St. Kitts is so close to Nevis as to seem part of it, but actually the two are divided by a turbulent gap called the Narrows, which native craft are unable to cross in heavy blows (Plate XXII).

We found the harbor at Basseterre so rough that we moved ashore to Shorty's Hotel, one of the pleasant spots of the Caribbean. Here Laura, the parrot who hates men, rebuffed my every advance but finally consented to pose for a picture (Plate IV).

Practically the entire effort of the community is geared to sugar. There is a huge factory, and every available foot of ground is under cultivation (Plate XVI).

Crowning a steep mass of rock is the fortress of Brimstone Hill, designed to be Britain's impregnable "Gibraltar of the West Indies." Guns were placed atop this limestone height as early as 1690; its last garrison was not withdrawn until the Crimean War.

During its long service it was besieged and captured only once: by the Marquis de Bouillé in 1782, who so admired the bravery of the defense that he returned the rival commanders to the British! Afterwards it was more heavily fortified but was never attacked. From its battlements there is a magnificent view (Plate XXIII).

Next we came to St. Eustatius, or Statia, our first Netherlands West Indies colony.

"What is that yellow flag?" asked the policeman in the stern of the rowboat alongside as our anchor splashed down.

"That flag?" I repeated in surprise. "That's the Quarantine flag—it means that we are coming from a foreign country and want to enter."

"Oh!" he said, swinging aboard. "You don't need anything like that. You're welcome here."

Later Ernest Voges, the governor, elaborated: "We're too small for red tape and all that nonsense."

First Salute to U. S. Flag Brings Calamity to St. Eustatius

At the top of the hill overlooking the roadstead harbor stands Fort Orange, whose cannon first formally acknowledged the sovereignty of the United States (Plate XXVII).

At that time Statia was called "The Golden Rock." As it was a Free Port, nearly all trade between Europe and the Americas funneled through the warehouses which lined its beaches. As many as 700 ships sometimes lay at anchor.

Into Statia on November 16, 1776, sailed the U. S. Brig-of-War *Andrew Doria*, flying the flag of the new Republic. Its guns roared out the national salute.

There was a long pause. Bluff old Johannes de Graaff, the governor, had a difficult decision to make, as Holland was at that time neutral. Then came the reply—the first salute to a flag of the United States.* While this honor encouraged the embattled American

* The flag saluted was the Great Union Flag raised on January 1, 1776, at Somerville, Massachusetts, in honor of the birth of the new Army. This early symbol of unity had 13 red and white stripes, but the Union Flag of Great Britain was in the canton in place of the stars. The first salute to the Stars and Stripes (as adopted June 14, 1777) was fired by the French in Quiberon Bay on February 14, 1778 (see "Our Flag Number," NATIONAL GEOGRAPHIC MAGAZINE, October, 1917).



"Donkey on Wheels," Twisting Down a New Road, Revolutionizes Life on Rugged Saba

Before this corkscrew highway was completed in 1947, the crater-pit town of Bottom carried imports 1,000 feet from Fort Bay Landing on porters' heads or donkeys' backs. Now comes a mechanical donkey, the jeep. Seeing it, several islanders ran to the hills. School children, taking their first ride, screamed when "houses went back so fast."

colonists, it incurred the wrath of the British—especially tough old warrior Rodney.

Nearly five years elapsed before he could take his revenge. Upon declaration of war against Holland in 1781, Rodney swooped upon Statia even before its inhabitants knew that peace had been ruptured. He did a thorough job. Its warehouses and homes were stripped and auctioned for over £3,000,000. What could not be sold was burned, and the warehouses were pulled down. Their ruins still lie scattered on the beach.

We arrived during a drought. The island was sere and brown, but amazingly neat. Even the town streets seemed freshly scrubbed. Governor Voges was most hospitable, insisting that we spend a night in his house, and giving us a party.

Among the guests were representatives of the Pandt family. An ancestor, Hendrick Pandt, was one of the signers of the capitulation to Rodney, which, incidentally, began: "Well knowing the honor and humanity of the two commanders . . ."

From Statia we looked across at Saba, a symmetrical shape that has reminded some of Napoleon's "cocked hat." The island had an air of mystery: its summit hidden by a cloak of white, while blue shadows made shifting patterns on its sides.

As we came closer, Saba looked even more forbidding. The sea creamed against gray rocks at its base. Fort Bay, the principal landing, offered poor shelter, for a big sea was running in the "anchorage."

"Governor" Huith, informed of our coming



Strong Arms and Calloused Feet Launch a Surfboat Across Saba's Stony Beach

Visitors are ferried from ship to shore and back. Like most passengers, the author's wife is carried out in a boat. Once the sea grips the stern, oarsmen jump to stations (Plate XXVIII).

by radiotelephone, met us in a surfboat. Before going ashore we put *Carib* on the leeward side of the island in the relative shelter of Ladder Bay—sheltered, that is, if the wind does not shift.*

Jeep Replaces Donkeys on Saba

On the island we found to our amazement that the machine age had arrived: a jeep now roars up a new road between Fort Bay Landing and the lofty town of Bottom! The road had been five years a-building; the jeep had been on the island only a few weeks (page 34).

When the jeep was first driven, several inhabitants took to the hills—the higher ones—and it was dubbed "the donkey on wheels." Now another road is being constructed to the more distant town of Windward Side, and it is rumored that KLM (Royal Dutch Airlines) will institute helicopter service by 1950!

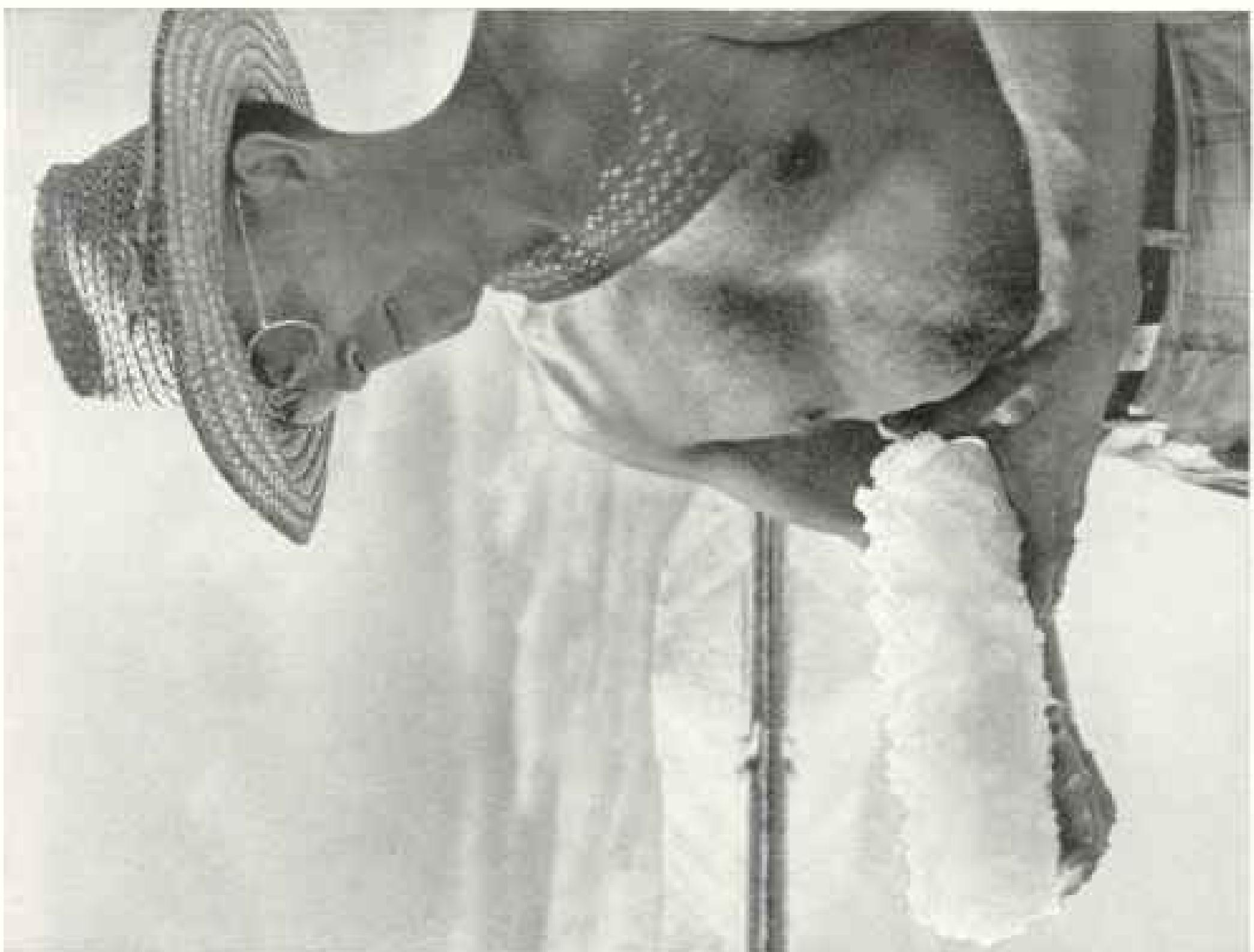
We had five delightful days ashore, staying at the Government Guest Houses at Bottom and Windward Side (Plate XXVI).

Saba is a place of amazing contradictions. The inhabitants are Dutch, yet speak English. Bills are quoted in Dutch dollars, which do not exist, and are collected in guilders. The town at the top of a mountain is called Bottom. Although producing little, Sabans during the war sent relatives in the United States packages containing soap, butter, and sugar.

The men are great sailors. Nearly thirty now captain U. S. steamers; the commanding officer of one of the first supply ships to make the original African landing was a Saban.

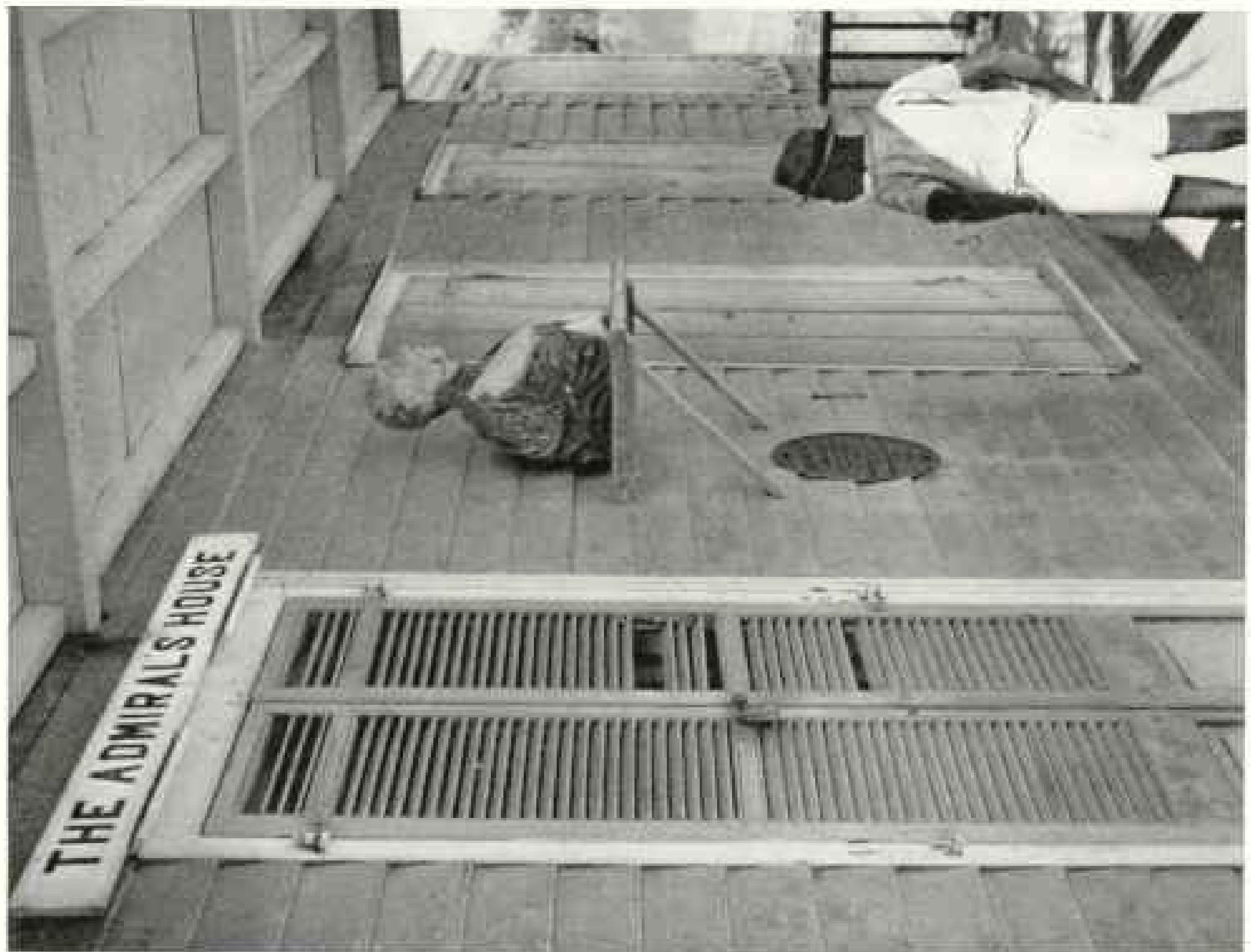
On leaving, we chose to ignore the jeep and to walk down the Ladder, the bane of earlier

* See "Saba, Crater Treasure of the Indies," by Charles W. Herbert, NATIONAL GEOGRAPHIC MAGAZINE, November, 1940.



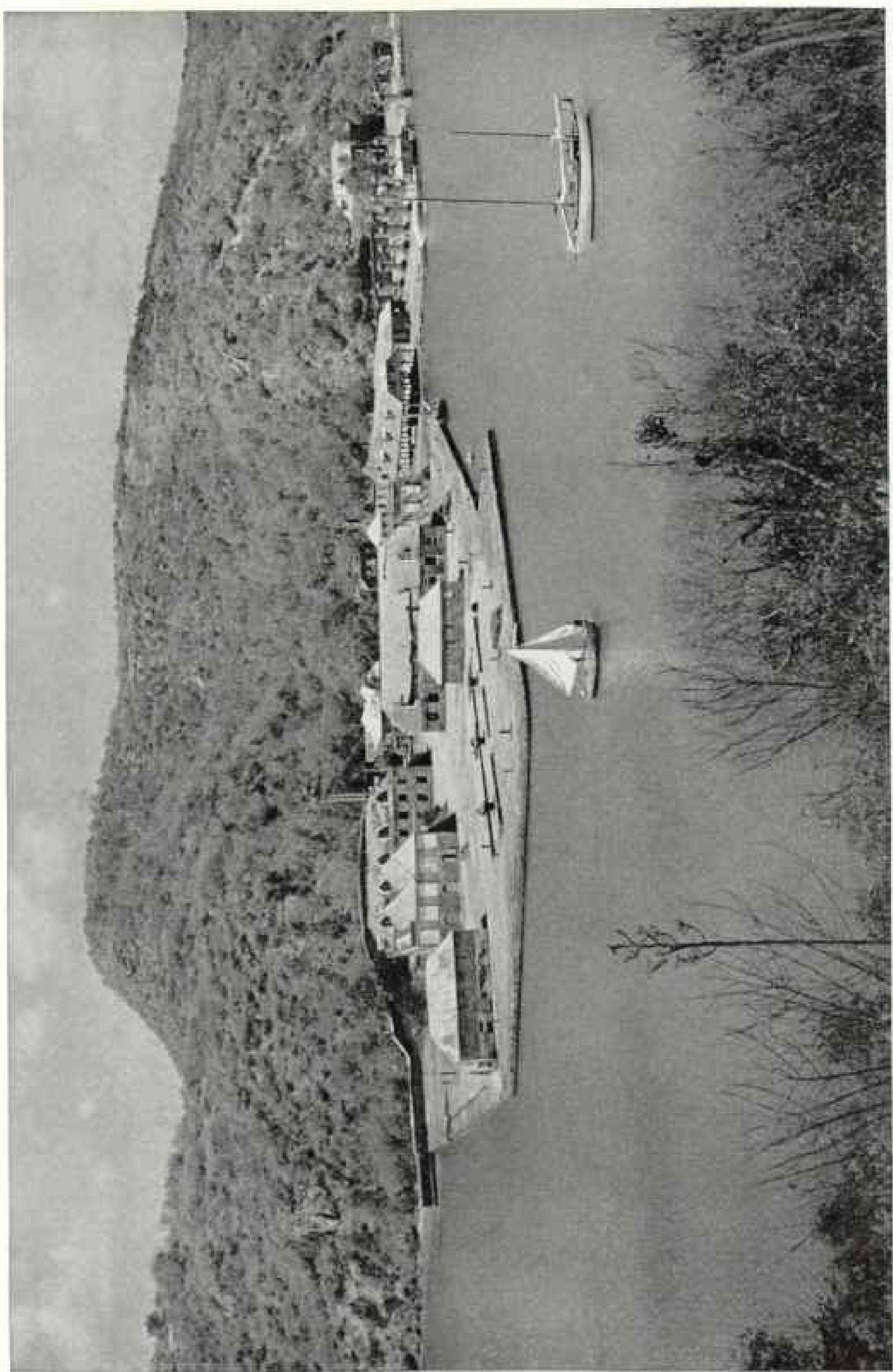
Produce of Sea and Sun . . . Salt from the West Indies

On Great Inagua, Bahamas, a foreman inspects a shovelful piled from the bottom of a salt pan. Since gates admit ocean breeze, tropic sun and constant trade winds evaporate the water quickly, leaving salt (Photo XXX).



Here Lived the Immortal Lord Nelson

At English Harbour, Antigua, Nelson commanded H. M. S. *Boreas* from 1784 to 1787. His old home is restored. Its original furniture was sold when English Harbour's dockyard was abandoned (pages 16 and 37).



Carrick and a Native Sloop Disturb the Stumbers of a Ghost Town, English Harbour, Once a Mighty Naval Base
In this Antigua anchorage the British fleet sought shelter from hooligan. Half a century ago the Admiralty abandoned it. On the breakwater stand old curving carpenters used for hutting down wooden ships. Only stone columns remain of the bathhouse (eight). Seamen's quarters are deserted.



Where Gossip Is as Lively as Barter: the Market in Roseau, Dominica

Into town stream parades of country people with headbarne cargoes of produce. Jamming the market's interior, they overflow to the curb. Their leisurely customers treat the street as a public forum. *Zib, Carib's mate*, made purchases almost daily at these open-air vegetable stands.

travelers. We had listened to arguments as to whether it consisted of 509, 513, or 533 steps but lost count before getting down (Plate XXVIII).

Saba is a notoriously bad place for yachts. During our visit I hired an islander to stay aboard with Al. Fortunately the wind continued to give them good shelter in Ladder Bay. But *Carib* did not get away unscathed.

On leaving, I gave Al a hand with the windlass, as all our chain was veered. There was a heavy pull, and then it came in easily. I called "It's broken out!" and cranked faster. But the anchor had caught under a rock and came up a useless bar, lacking flukes.

For a couple of days the weather had looked threatening. Solar and lunar halos, combined

with weird cirrus cloud formations, made me think heavy winds were in prospect (page 39). Between us and St. Thomas lay the hundred-mile waste of the Anegada Passage, not renowned for its gentleness.

We left Saba late in the afternoon and carried a beautiful quartering breeze throughout the night.

But the dawn sky made us glad that St. Thomas was just over the bowsprit. As we picked up a mooring, in the most sheltered part of Charlotte Amalie harbor, a hard squall swooped down. For the next five days we lay snug while the strongest winds of the winter lashed the island.

From St. Thomas we backtracked through the Virgins to see our old friends, Louis and



Cirrus Cloud Formations, So Beautiful to Behold, Fill the Sailor with Misgivings

Seen on Saba Island, these gaudy sky effects disturbed the skipper as he contemplated running the 100-mile Anegada Passage. The weather remained fair, however, until *Carib* berthed down in Charlotte Amalie, Virgin Islands; then she was windbound five days.

Beth Bigelow, at Guana Island. It was just as beautiful as we remembered it from our visit before the war.

"Did you ever see a lobster caught with a forked stick?" asked Louis.

"Can't be done," I replied—to be proved wrong with little delay.

Taking two Tortola boys, we went to a cove on the windward side. One of the boys carried a tree branch cut to form a deep fork; the other, a rod. They selected a promising coral ledge, and the one with the forked stick took a position about 20 feet away.

After a moment of prodding with a rod a crawfish streaked for open water.

The forked stick came down, and there we were with dinner! The crawfish could be seen

through the clear water (Plate XXIX, right). What still puzzles me is how the boy knew where to stand!

After rounding the curious rock formation that looks exactly like the head of a giant lizard, and from which Guana takes its name, we glided back through beautiful channels to the familiar mooring at Charlotte Amalie. Here *Carib* was hauled and painted while a recalcitrant generator was repaired.

Since the Navy was holding firing practice off Culebra Island, we could not lay a direct course for Puerto Rico but had to keep clear of a restricted area that extended south almost to Vieques Island. Still, before dark we were in the harbor of Fajardo, a commercial port at the eastern end of Puerto Rico.

The next morning we bounced through the gap behind the Cordilleras Reefs, and on the afternoon of April 27 came to anchor off the Club Nautico in San Juan Harbor.

Thus ended one phase of our cruise. We had planned to loaf from Port of Spain to San Juan, staying at each island as long as we wanted, anchoring every night.

We had taken three and a half months to sail 900 miles. So far the three of us—helped by guests on a couple of short runs—had sailed up without hardship or difficulty. But from here on we had to do some passage making.

Long runs can be very tiring when only two men must split "watch-and-watch." To our delight we were joined by an old shipmate, Henry K. Rigg, of Annapolis, a top sailorman.

Steady Trades Fill Our Spinnaker

We gave Bunny a fine introduction to Trade Wind sailing; after we left San Juan Harbor the wind was dead astern, so we hoisted the small spinnaker—a parachutelike sail set on the opposite side from the main. The mizzen, or after sail (Plate XXXII, upper) was doing little except blanketing the main, so we furled it, rigged a cockpit awning, and slid along admiring the view and pitying all landsmen.

But conditions did not long remain ideal—they never do, not even in this part of the world. With night the breeze dropped off to leave us wallowing horribly in the Mona Passage, where we had anticipated good wind.

With morning the Trades came back, and for the next two days and nights the storied coastline of Hispaniola lay to port as *Carib* rolled along in the track of the early Spanish navigators.

We were at Cap Haïtien before dawn of the fourth day to replenish our supply of ice and fresh stores, and to make a visit to Christophe's palace.

The next stop was the island of Great Inagua, one of the Bahama group, where an American family, the Ericksons, have revived the ancient salt industry. Sea water is run into flat areas called "pans" to be evaporated by the fierce heat of the sun (page 36). Salt forms in huge crystals on the bottom and is harvested by hand or machine.

At one stage the water becomes a deep rose in color. This is caused by red algae that grow in the brine—an expert can estimate the density by the color (Plate XXX).

On my stop the year before only Bill Erickson was on the island, as his brothers were still in military service; this time, however, the family was reunited, and we were fortunate enough to arrive for a party.

No one could see this group and what

it has accomplished without realizing that the old American pioneering spirit has not died.

Beyond Great Inagua lay familiar waters. We were backtracking our runs of the previous winter—the Mira Por Vos Pass, Crooked Island Passage, and Exuma Sound.

The wind stayed in the east as we slid along with sheets freed and a fishing line trailing astern.

Nassau is like a second home to us, and it was with excitement that we dropped anchor off Prince George Wharf.*

For the last lap we were joined by another friend, Dan Rugg, of Pittsburgh, just recovering from an illness. While some might question the benefits of a pitching small boat for the relief of a stomach disorder, Dan improved rapidly—proving that nothing really bothers a true sailor except life ashore.

The favoring current of the Gulf Stream helped us on our ocean run up the Atlantic coast, and 3 days, 4 hours and 30 minutes after we crossed the bar off Hog Island, buoy "6C" at the entrance to Charleston, South Carolina, was alongside.

As *Carib* passed through the jetties, the water changed color from blue to muddy brown, and another phase of the trip was finished. We had covered the 1,500 miles from San Juan in three weeks, even with a week's layover in the Bahamas.

For the next five days we "ditch-crawled" the Intracoastal Waterway, powering up through the Carolinas and Virginian, enjoying the scenery and the mirror-smooth water, almost overwhelmed by the perfume of the honeysuckle that grows along the banks of the canals.

"Beware of the Chesapeake!"

The weather forecast at Norfolk promised fresh winds, but it took the motor to push us up the home stretch, Chesapeake Bay. Then, off Thomas Point Light, with almost 3,000 miles astern and only 3 ahead, we had our tragedy.

I was lazily at the wheel admiring a white steamer and the graceful curve of the bow wave as it spread across the glassy water.

Suddenly *Carib* stuck her snout into that wave, her mind doubtless occupied by thoughts of her comfortable stall at the Annapolis Yacht Club, now so near. She gave a startled leap, and there was a crash from the cabin—the coffeepot had upset over everything!

"Beware of the Chesapeake on a calm morning," someone should have warned.

* See "Bahama Holiday," by Frederick Simpich in the NATIONAL GEOGRAPHIC MAGAZINE, February, 1936.



© National Geographic Society

Autumn colors by Carleton Mitchell

On Gala Occasions Martinique Girls Dress in Printed Silks of a Bygone Era

When Lafcadio Hearn visited the island in 1887, such costumes were common. Now grandmother's jewelry and silks repose in mothballs; Martinique has gone modern. Tying the headdress like a turban takes skill.

Pelée, Killer of 40,000 People, Slumbers. Trustfully, St. Pierre Rebuilds Its Homes at the Volcano's Base



In Such Fruit Canoes Martinique Fishermen Venture Beyond Sight from Shore. Their Nets Dry on Belle Fontaine Beach



XX
© National Maritime Museum
Carib Swings at Anchor under an Arm of the Crucifix Overlooking Bourg des Saintes
Fort Napoleon looks down from the hill (extreme right). Guadeloupe looks across the channel. Manoeuvring in these waters, Rodney defeated de Grasse in the Battle of the Saints (1782). By this (e)minent engagement Britain gained control of the seas in the West Indies and won the war with France.

Watercolour by Captain Marshall



Courtesy of M. Smith

Skipper Raises the Burgee of the Cruising Club of America

Cribby overnight at Little St. Vincent, a rarely visited island in the Grenadines.

XXI

Whitman & Ontario Matched

Airman Turned Sailor Quits Wings for Sails

Al Nelson, hatch of the Army Air Forces, is Cribby's professional seaman.

© National Geographic Society



Shoppers Scamper Down to Basseterre's Bench as a Boat Comes In with Fresh Fish

Although it's one port of St. Kitts, the volcanic cone of Nevis in the distance is separated by a two-mile channel impassable to small native craft in heavy swells.



(Courtesy of National Gallery of Art)

XXIII
On Brimstone Hill in Old Muzzle-loader Points Peacefully at St. Kitts's Cane Fields, Looking Northwest; Saba (Left) and St. Eustatius
At this "Gibraltar of the West Indies," 8,000 Frenchmen besieged 930 British.





A Seagoing Cook Comes Topside for a Trick at the Wheel

In emergencies, when all men are needed on deck, Mrs. Mitchell forgets her galley and takes the helm.



© National Geographic Society

Kodachrome by Captain Mitchell

Carib Rolls, the Seas Toss; Spume and Cloud Seem to Mingle

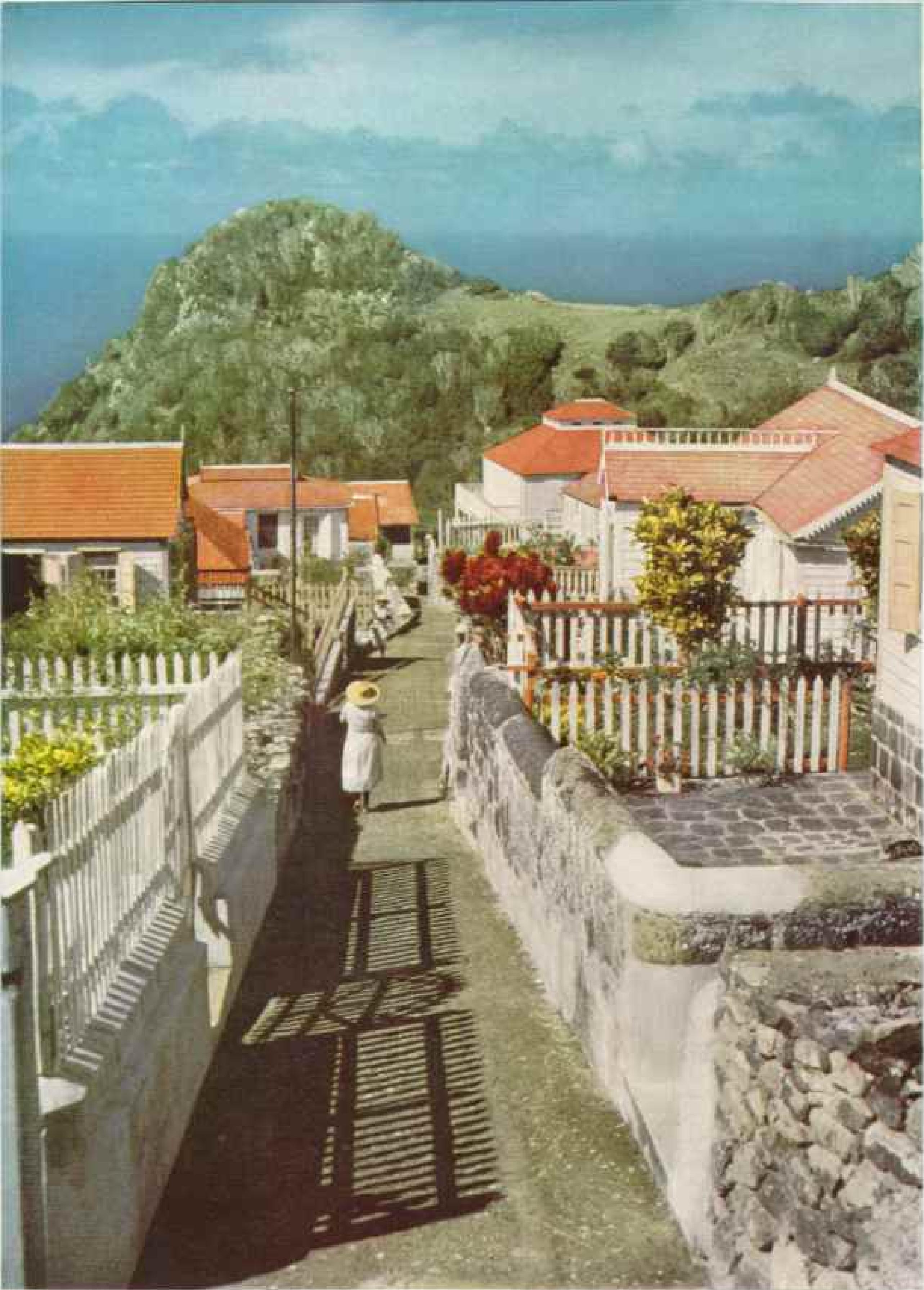
"Watch out for that Dominica Channel," friends warned, but the author's party had a glorious sail. Through the spray loom the mountains of Dominica (left).



© National Geographic Society

Photograph by Carlton Mitchell

In Oilskins on *Carib*'s Bow Stands the Skipper's Wife, Looking Out for Coral Heads
Through the clear waters of the Bahama banks, coral formations, sponges, conches, and fish can be seen as if in an aquarium window. The skipper conned the *Carib* into many shoal harbors by watching the water's color.



© National Geographic Society

Chromes by Carlton Mitchell

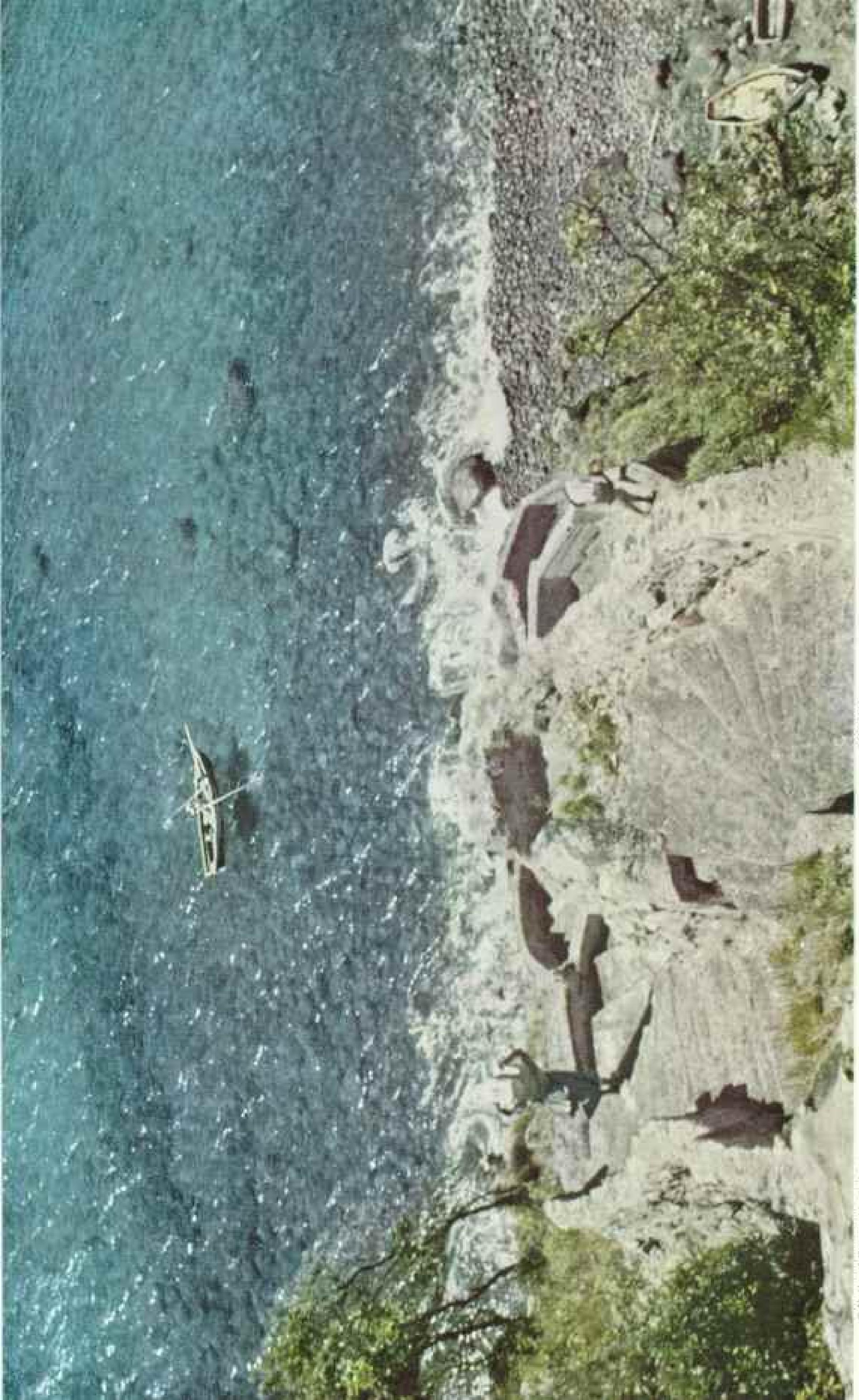
Everyone in Windward Side Enjoys an Ocean View, but a Swim Costs a 1,200-foot Climb
Breezy Windward Side stands on Saba Island, Netherlands West Indies. Saba's Dutch sons roam the seven seas, but almost all come home eventually. Their native rock was one of the buccaneers' last strongholds.



© National Geographic Society

Illustration by Carleton Mitchell

Here the Infant United States Flag Received Its First Foreign Salute, November 16, 1776
In Fort Orange, St. Eustatius, an old Dutch cannon points to sea. During the Revolution, similar guns acknowledged the nationality of the Baltimore privateer *Andrew Doria*. The Netherlands flag still flies over the island.





Virgin Islands Lobsterman Pins 'Em with a Forked Stick



"Bunny" Rigg Douses the Skipper with Tropic Cold

© National Gypsum Co., Inc.

XXIX

In Century-old Pans the Fierce Heat of the Sun Extracts Salt from Sea Water. Algae Dye the Brine a Deep Rose Red

Here on Grafton Inagua the Frickson family of Boston has revived an old Bahamian industry. The white mountain is not snow in the Tropics, but salt awaiting shipment.



Photograph by Gordon Mitchell

NNX1

© National Geographic Society
So Transparent Is Nassau's Green Water that a Bather's Shadow Falls 12 Feet on the Sea's Sandy White Floor





Illustration by Christian Mitchell

All Windward-working Sails Drawing, *Carib* Says Farewell to the Caribbean

Designed by John Alden and built in Maine, the ketch carries her No. 1 jibtopsail, forestaysail, mainsail, and mizzen,



© National Geographic Society

Photographs by Christian Mitchell

Home! Annapolis! Ahead Lie Maryland's Domed Capitol (Left) and the Naval Academy

Seal Hunting Off Jan Mayen

By OLE FRIELE BACKER *

SEALING in icy seas even today means bold adventure. Big ships and powerful engines help reduce the hazards, yet vessels are lost nearly every year, "screwed down" (crushed and sunk) by relentless ice.

As a youngster I feasted on all the books I could find about the sealers' life of hardship and danger. I became almost sick with wishing—wishing I could be running over the northern ice floes as one of the hardy seal hunters.

Years passed, and last spring when 31 sealing ships set out from Norway for the "Western Ice," I had a place on the motorship *Polhavet* ("Arctic Sea").

The "Western Ice" is the Norwegians' name for the rich seal-hunting region in the Norwegian Sea north of Jan Mayen Island, between Iceland and Spitsbergen (map, page 61). There, where they crawl out on the ice to whelp, harp and hooded seals are killed by the thousand for the fur of the new-born young and for blubber.

Eighteen of the 31 ships sailed from our home port of Ålesund, the other 13 from Tromsö.

Sealing Fleet Sails North in March

In the first days of March Ålesund was astir with preparations (Plate II). Winter's white mantle lay over the tidy little coastal town. Snow still fell; March very often is our month of heaviest snowfall. But the sun lifted higher every day, its rays bringing new life and energy to Nature and humans alike.

The bustle of activity reached to every corner of the harbor. The season of the herring fisheries was drawing to a close. Interest shifted to the seal hunters, preparing ships and gear for the voyage to the Arctic. Crews overhauled their vessels and swung aboard fuel and stores.

The round trip to the sealing grounds takes about six weeks, but provisions must be carried for three months in case ships are caught in the treacherous ice.

The great day came. At last we glided out of the harbor. As soon as we hit the open sea, setting course for the forbidding island of Jan Mayen, the captain ordered sails set, not so much to supplement the engine as to steady the lurching ship. Built round-hulled, like a bowl, so heavy ice would lift her from the water instead of crushing in her sides, the *Polhavet* pitched and rolled worse than any vessel I had ever been on before.

The sturdy old ship had withstood the buffettings of 30 years at sea. Modernization had given her electric light and a new engine, which pushed her along at nine knots.

Like many other sealers, the *Polhavet* was solidly built of oak with a tough skin of green-heart. Thus armored, she could withstand the crudest clawing of the steel-hard ice.

The skipper sensed an approaching gale and had to reef canvas. Stiff with ice and snow, the sails seemed to fight the crew's struggles to subdue them.

Johan Vartdal, 44 years old, was our hard-bitten captain. He is one of Norway's leading Arctic pilots (page 63).

Our crew consisted of 16 men, 11 of whom were to do the actual seal killing. Two of the hands were sons of the skipper and others also were relatives. All were young, between 17 and 30 (page 58).

Keeping us company was another ship, the *Kvitungen* ("Whitecoat"), whose skipper is a cousin of Vartdal (Plate III).

Weather Station on Wild Jan Mayen

A howling head wind from the northwest slowed our progress. It blew the whole week it took us to reach Jan Mayen. Through breaks in the fog we caught glimpses of that rocky island, citadel of Nature at her wildest and loneliest. Some call Jan Mayen the stormiest spot in the world.

A permanent Norwegian meteorological station clings to the remote island. Bad weather prevented our landing, but we made contact with the station every day by radio.

In addition to giving us weather reports twice a day, the isolated weathermen were glad to transmit our telegrams back to relatives and friends in Norway.

Half the crew was seasick going north, but now that was forgotten. Everybody thought and talked about only one thing: seals!

The skipper spent his days up in the crow's-nest looking for the drift ice. He climbed down for infrequent meals to get warmed up. Then back he would clamber to his high perch (Plate III and page 60).

A round-the-clock watch was maintained on the radio, listening for messages between other ships ahead to get a preview of ice conditions and to learn if anyone had yet spotted seals.

A Norwegian regulation governs the opening of the sealing season. Last year killing of

* The author is a distinguished officer of the Norwegian Navy.



© Mr. Fred Berlin

A Modern Viking Begins His Arctic Apprenticeship

Seventeen-year-old Ingevald made his first voyage to the Arctic in *Pelkaen*. Crew members of the sealing fleet are young, capable, and carefree. Flaps of his woolly hat pull down over the ears on nippy days. The hunt is in March and April, when ice-pack weather is raw and cold.

seals could not start until 7 o'clock on the morning of March 23. This protective regulation was put in force as a result of careful studies of the life habits of seals. The noted zoologist, Per Höst, conducted the researches over a span of several years on behalf of the Norwegian government.

Ships Must Explore First

But the ships must be on the spot at least a week before the opening date of the season to explore ice conditions and try to locate seal herds. This often entails steaming hundreds of miles through stubborn floes.

That night we drifted among the floes, moving only as they moved. We relished the first good hot meal in days. After drying out our fog-dampened bedclothes we all settled in for a long night's rest.

The search continued a few more days until, on the afternoon of March 23, we began to pass many herds of seals in the water. At sunset hundreds could be seen dotting the ice. The females were just about to start bearing their babies.

Captain Vartdal decided to stay put for the night in order not to frighten the animals.

The wind had been rising all afternoon and

We sailed northeast from Jan Mayen to 74° N. Nothing but open water! The skipper turned westward. Next day we met the first scattered pans—outriders of the "Western Ice."

Soon, up ahead, we saw the telltale whitish band above the horizon which forewarns of ice fields. This iceblink, as it is called, is a reflection in the sky from ice just over the horizon.

In a few hours we drove into the drift ice (Plate VI).

It was like entering a new, strange world. The sudden quiet was oppressive. Small ice floes, shaped like pancakes, surrounded us. Now and then we saw seals swimming in the leads of open water. Fresh tracks of a polar bear scrawled an unmistakable signature across a big pan.

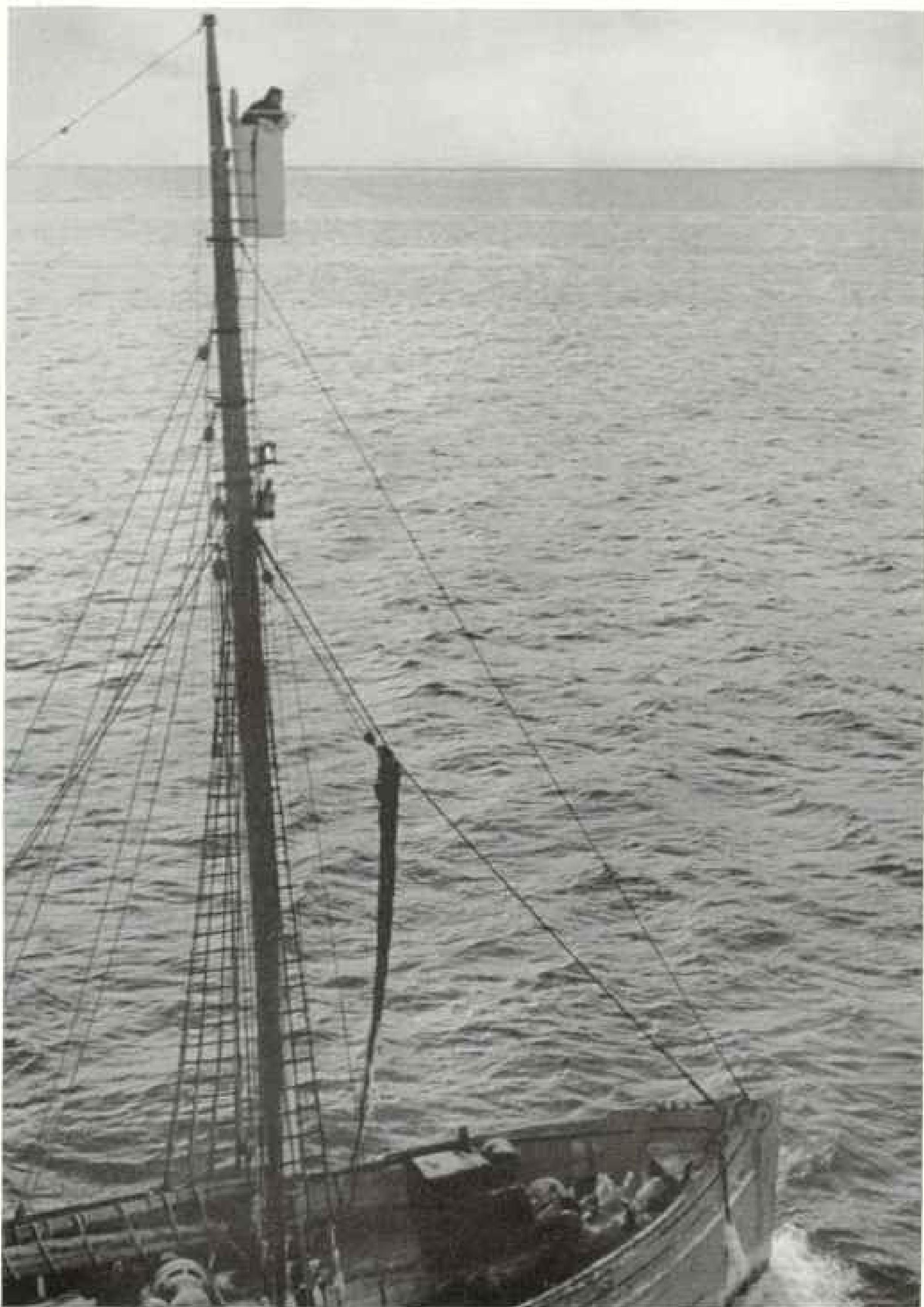
The floes got bigger as we bumped and battered along. From the crow's-nest the skipper waved and called directions, trying to dodge large floes and scattered icebergs. Constantly he scanned the ice fields with his telescope, searching for our sleek quarry.



© The Friese Barker

Frozen Spray Camouflages *Veidemann* to Blend with Black Water and White Ice

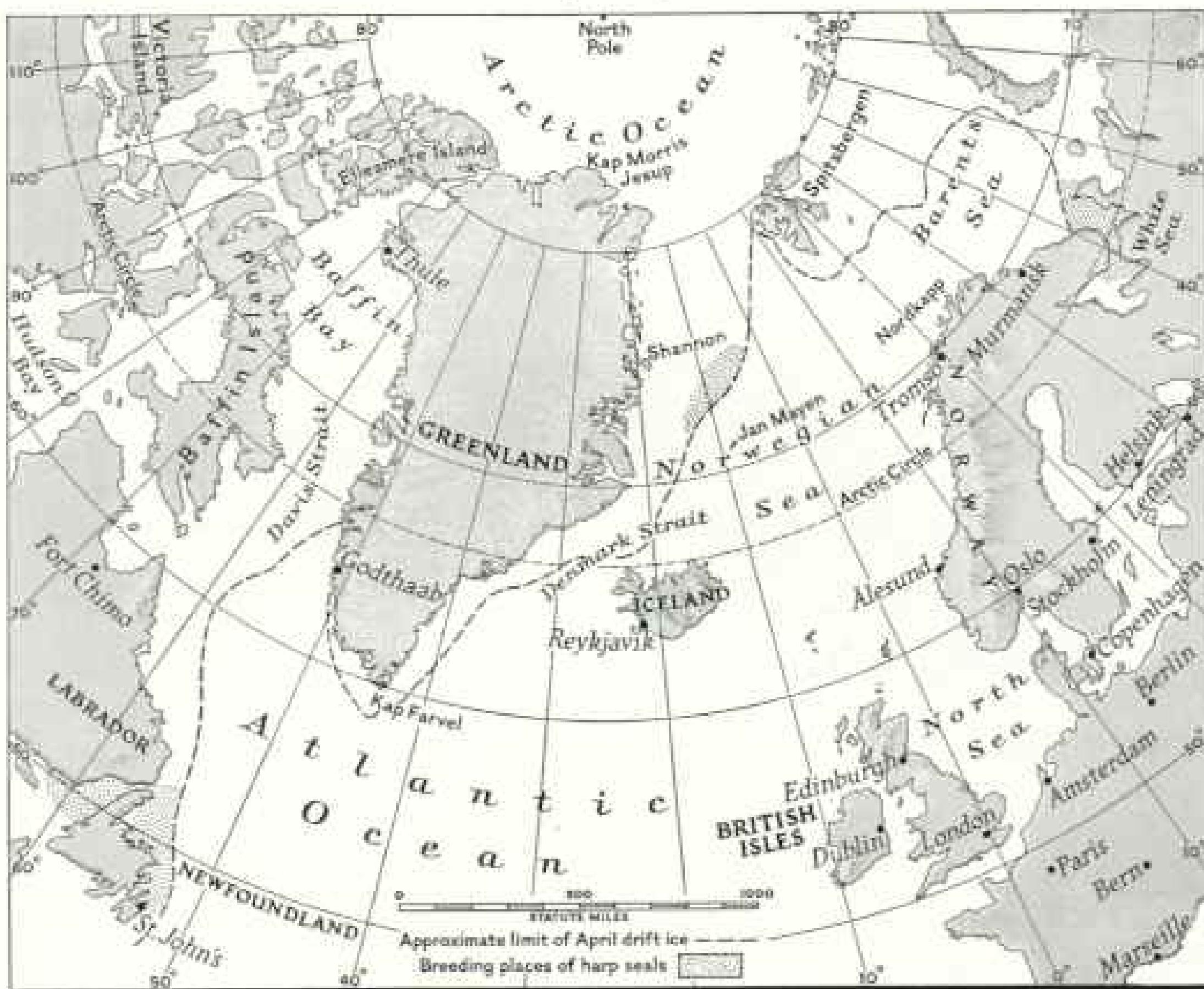
Name of the vessel means "The Hunter." Small fleets of these sturdy sealing craft sail from Alesund and Tromsø every spring. Although the round-trip voyage to hunting grounds takes only about six weeks, the snug little ships must carry supplies for three months in case they are frozen in the ice.



© Ole Peter Backer

Ships Draw Together so Captains in Crow's-nests Can Have a Chat

Captain Kvien of the *Kvitbjørn* talks to *Polkhet*'s skipper. Calling directions to the helmsman, the captain aloft seeks out leads in the pack ice and locates distant seal herds. From the high barrel the ocean horizon is about ten miles away, and an area of approximately 300 square miles is visible.



Drawn by H. E. Barnes and Irvin E. Altman

Wide Ocean Stretches Separate Drift Ice "Nursery" Areas for Harp Seals

Dotted portions of the map show approximate limits of three principal places where harp, or Greenland, seals crawl out in thousands on the shifting ice pans to give birth to their young. The "Western Ice," scene of the seal hunt described, lies north of Iceland off Jan Mayen Island in the Norwegian Sea. The line of dashes marks the approximate boundary of drift ice during the season of the whitecoat hunt.

now it blew briskly. Millions of tiny ice crystals picked up and borne away by the breeze created a spectacular red sunset. The wind also raised heavy swells underrunning the ice. This was not so good; heaving of the ice would make our work difficult and dangerous.

Close by we could hear the whimpering of the baby seals calling for their mothers. It sounded like the cry of a baby or a sea gull. At first I thought it was somebody out on the ice calling for help.

Everything was made ready for the next day. The men ground their knives and looked to their guns. We all were keyed up with a tense feeling of excitement and anticipation.

Tomorrow!

These first herds were harp seals—by far the most numerous and valuable of the Arctic seals. Three main breeding places of this species (*Phoca groenlandica*) are known: one in the drift ice off northern Newfoundland and southeastern Labrador, another between

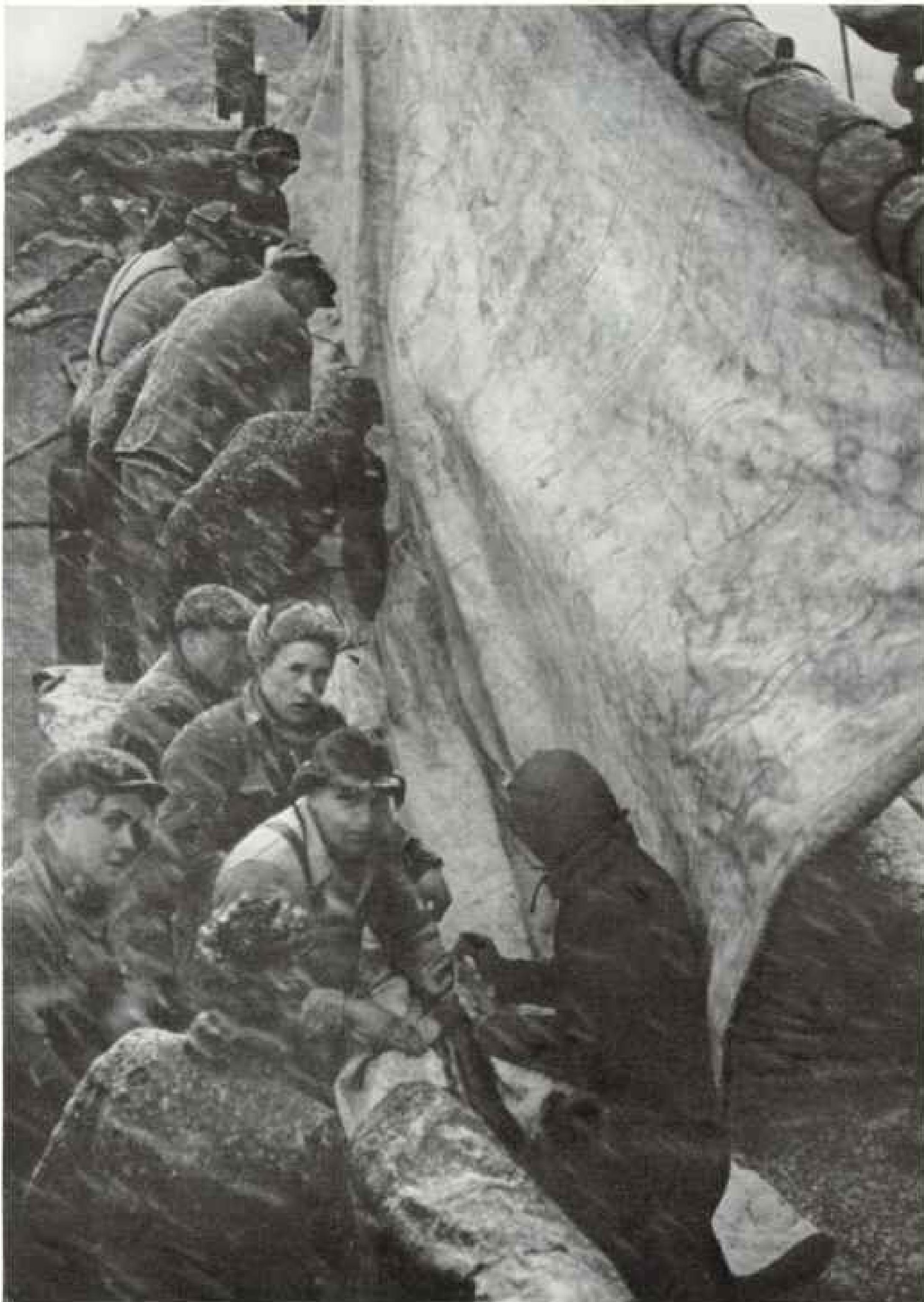
Iceland and Spitsbergen—the "Western Ice"—which also is a breeding ground for the hooded seal, and the third at the mouth of the White Sea on the Arctic coast of Europe.

Commercial sealing off Newfoundland dates from as early as 1800, with an annual catch, in its heyday, of about a half-million seals. This prodigal slaughter was a major cause for the rapid decline in sealing.

The average Newfoundland catch during the last ten years before the war was nearly 170,000 seals annually. Last year it was 96,782 seals taken by 13 ships.

In the "Western Ice" last year the total Norwegian catch in March and April by 31 ships was around 60,000, mainly baby seals. Most of our ships went back in May to the east coast of Greenland to hunt adult seals.

For years the Norwegians also hunted in the White Sea, bringing to port in 1925, for example, 340,000 seals from this fishery alone. In the last 25 years, however, the Russians



© Die Presse Berlin

It's Springtime in the Norwegian Sea! Ship's Hands Reef a Sail Stiff with Ice

When floes damaged *Poharet's* hull and rudder, and pumps barely kept her afloat, youngsters of the crew ate up the last of the eggs and other delicacies given them by mothers and friends before departure. No use to let Davy Jones get them! Hasty repairs, however, saved the ship (page 64).

have increased their sealing. Last year they refused to give the Norwegians letters of safe conduct, offering as the reason danger from mines.

Headlong Race over Slippery Ice

Long before dawn on the first day of our hunt all hands were up and eager to go. The ice crew climbed overside and sprinted after the startled seals. Men jumped from slippery floe to floe, constantly risking a fall into the frigid water. Across black, treacherous leads they made long leaps (Plate VI).

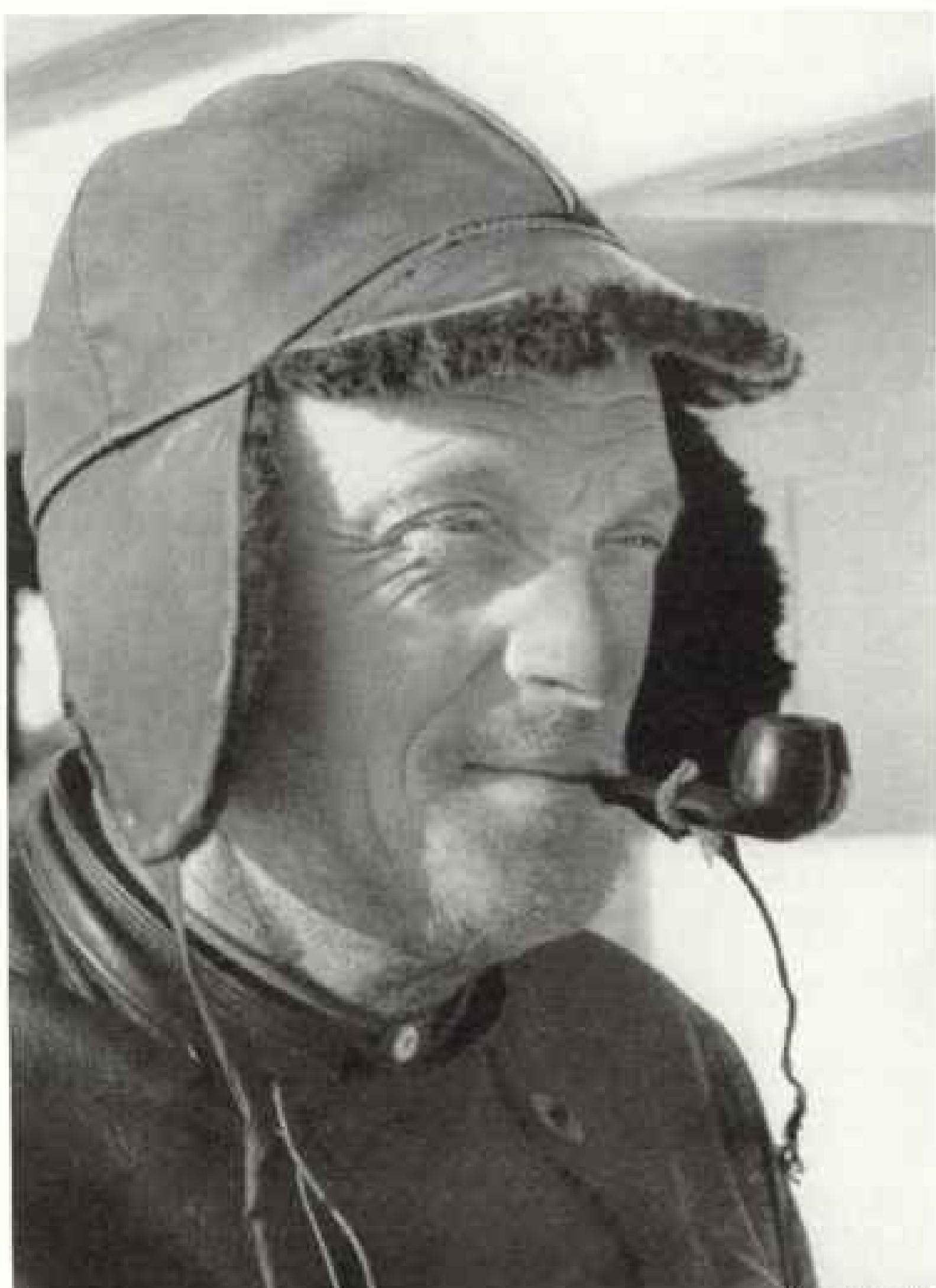
When one of the men fell in, his comrades quickly helped him out. Such mishaps occurred many times a day, but in the clear, clean Arctic air no one caught cold.

Dispatching the baby seals as quickly and mercifully as possible, the men brought them to the ship for skinning (Plate IV).

It seemed a crime to kill those lovely cream-white pups. They looked so sweet and innocent, staring up at us out of big, dark eyes set in their soft spotless pelts (Plate V). It did not make the work any easier when the mother seals lifted heads above the ice to look for their youngsters (Plate VI).

The baby harp seal must be taken while it is only a few days old. Then the pelt is soft and white, yielding a luxurious fur known as "whitecoat," which is also the name given to the young of this species. At birth the pup weighs seven to nine pounds, but when it is two weeks old it has put on a two-inch layer of fat and weighs between 40 and 50 pounds.

The fat provides a food reserve, needed because after about two weeks the mother leaves the young seal for long intervals while



Mr. Fritiof Backer

Smiles and Storms Have Seamed the Skipper's Face

Capt. Johan Vartdal of the *Pohjaret* looks through eyes narrowed from scanning vast fields of glaring ice. Although only 44 years old, he has been one of Norway's leading Arctic pilots for 25 years (page 57).

she returns to the sea to feed. The newborn whitecoat is not able to fend for itself until about a month after birth.

Between the ages of 14 and 20 days the infant seal loses its woolly baby suit and begins to grow a coat of stiff gray hair. Then he ventures into the sea for food.

Seal Liver Delicious

Seal meat is dark and dry. It tastes fairly good, but I would not call it a delicacy. It is used a lot on sealing vessels to supplement fresh meat brought from home. The liver is delicious, better to my taste than any calf's liver and very rich in vitamins.

The crew skinned the seals as soon as possible after hauling them aboard, while the animals still were warm (Plate VII). Thus the men saved their hands from frostbite in the chill Arctic weather.

The skinners have to be very careful. A small cut may lead to what is called "fat finger," a sort of gangrene that makes the wounded digit black and hard as wood. It used to be almost incurable, but now it yields to the magic of penicillin.

Baby seal pelts are most valuable, but we also shot some adults. Their stiff, hairy hide does not yield fur, but special treatment makes it soft and lustrous for use in gloves, handbags, and other accessories.

Mounting heavy swells now began to break up the ice floes. Many infant seals slid into the water and drowned, for during the first weeks of their life they cannot swim. Catastrophes like this may take a much greater toll of the herds than does hunting.

Fortunately, most of the mother seals had not yet given birth to their young, and they simply dived into the ocean and vanished. We never found this herd again. Its members probably swam many miles to the thick pack, which we could not penetrate.

That day we got 500 seals.

"Prepare to Abandon Ship!"

The next night big ice floes crashing against the ship woke us time and again. At 3 a. m., a very strong bump jarred me out of sound sleep. A few minutes later word came down, "Prepare to abandon ship!"

The rudder had been smashed, and the stout old *Polhavet* had sprung a leak. It was not a pleasant situation, but everyone took it calmly. Lifeboats were swung out. Using a tarpaulin, the crew managed to check the leak. With the help of the pumps we contrived to keep afloat.

A few of the men, toiling long hours, succeeded in straightening the rudder. The work was ticklish, demanding skill and bravery. Like aerial performers in a circus, the men swung on ropes under the craft's stern.

While all this was going on, some of the youngsters whose hands were not needed fried their last eggs and finished off the last of the good things which their mothers had given them when they left home.

Toward evening the ship was almost tight again. She was difficult to maneuver but could go straight ahead and even turn a little to starboard. She could hardly be swung to port at all.

If the rudder had been lost, it would have been impossible to guide the *Polhavet*. We

would have been compelled to ask another sealer to pick us up and to leave the faithful, battered veteran to her lonely fate.

Hunt Turns to Hooded Seals

"Several thousand hooded seals found at 73° N., 9° W.!"

The electrifying message, received by radio, put new pep into everyone. Next day we headed for the reported position, west of our previous hunting ground. Soon we met other ships steaming the same way.

At noon we started sealing again, though the damaged rudder made the work difficult. We bumped into one big floe after another, despite the skipper's skillful directions.

The hooded seal (*Cystophora cristata*) is much bigger than the harp, some weighing up to 900 pounds. Strong and fearless, it often has scars on its hide, apparently from encounters with polar bears and fights with other seals.

Baby hooded seals are bigger than the whitecoats and may weigh 100 pounds. Their pelts, with a blue tone on the back, name the animals "blueback." The attractive fur is prized as trimming for ladies' coats (Plate I).

With today's high prices, the thick fat layer (blubber) of the blueback is just as valuable as the pelt. Fur and fat together, they are worth about 100 kroner (\$20.20) each.

We took about 400 bluebacks. There must have been at least 5,000 in the vicinity. All ships in the area had flocked to this one spot. At nightfall we counted 30 masts.

One ship was missing, the *Hanseat* of Tromsö. She had been frozen into the ice.

"What did I tell you!" Captain Vartdal remarked when he heard the news. "On the very first day in the ice she got a polar bear. That always means bad luck."

The *Hanseat* did not break loose until six weeks later—with only 40 seals on board.

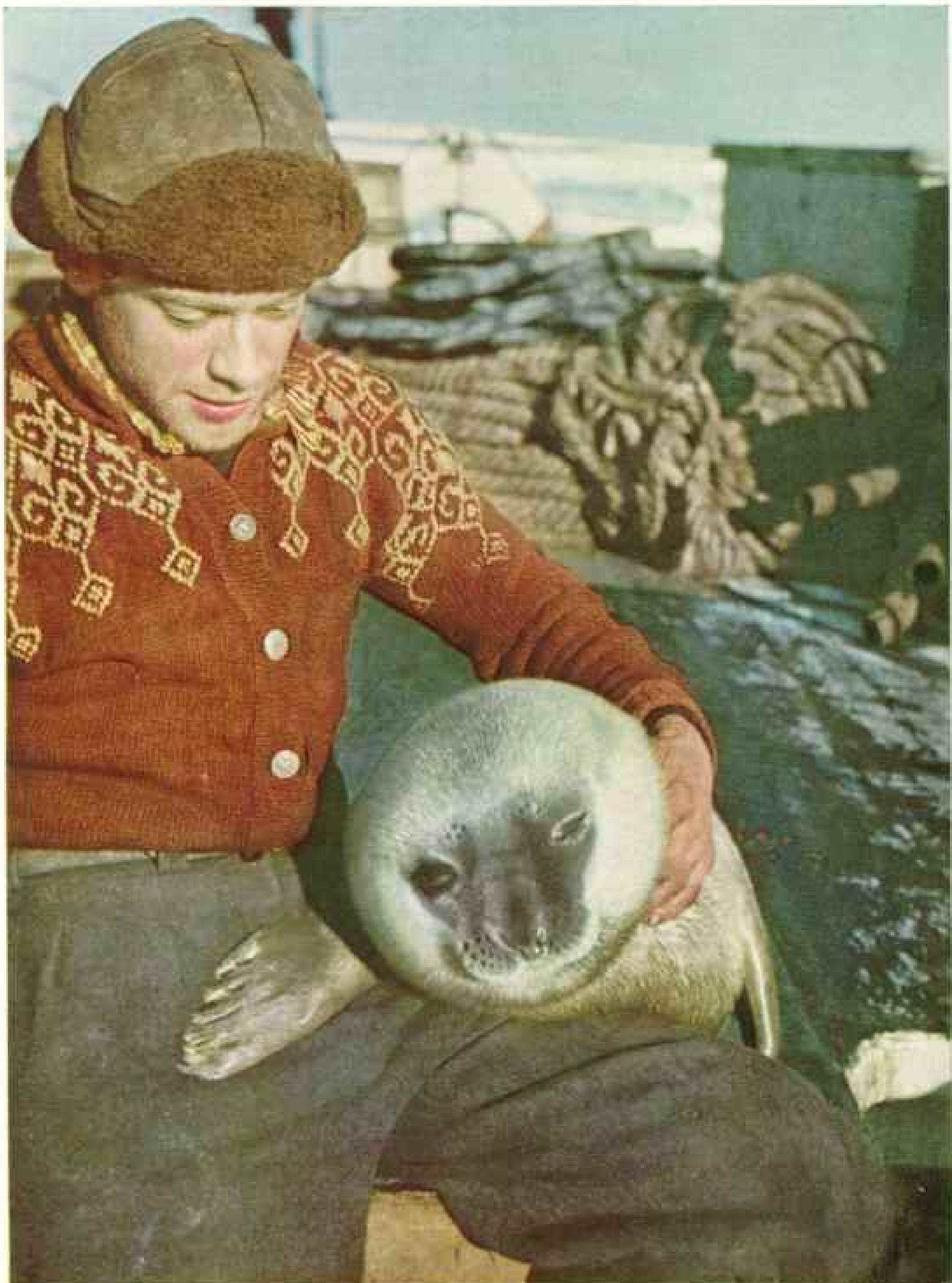
Next day we found a few more seals. By then the sea had calmed so we could inspect our damage in detail. It was evident we were about to lose the rudder! To save his ship, the skipper headed for home at once.

Our total catch was 1,000 seals, worth about 80,000 kroner (\$16,160). Each crew member, working on shares, would collect about 1,400 kroner (\$282.80). After settling expenses and paying for repairs, the ship still would make a small profit.

Two more days of thumping through the ice and then—700 miles of open sea, home stretch of a long voyage.*

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Sealing Saga of Newfoundland," by Capt. Robert A. Bartlett, July, 1929.

Seal Hunting Off Jan Mayen



© National Geographic Society

Photographer: Ole Friele Backer

Baby Seal on Hunter's Knee Will Give His "Shirt" to Adorn a Fashionable Lady

Hooded seal youngsters are called "bluebacks," because of their soft, blue-gray fur. Ole Friele Backer of Oslo voyaged with Norwegian sealers to ice fields off Jan Mayen Island to picture the annual spring hunt of harp (or Greenland) and hooded seals. Three weeks' catch by 31 ships was 60,000 seals, mostly babies.

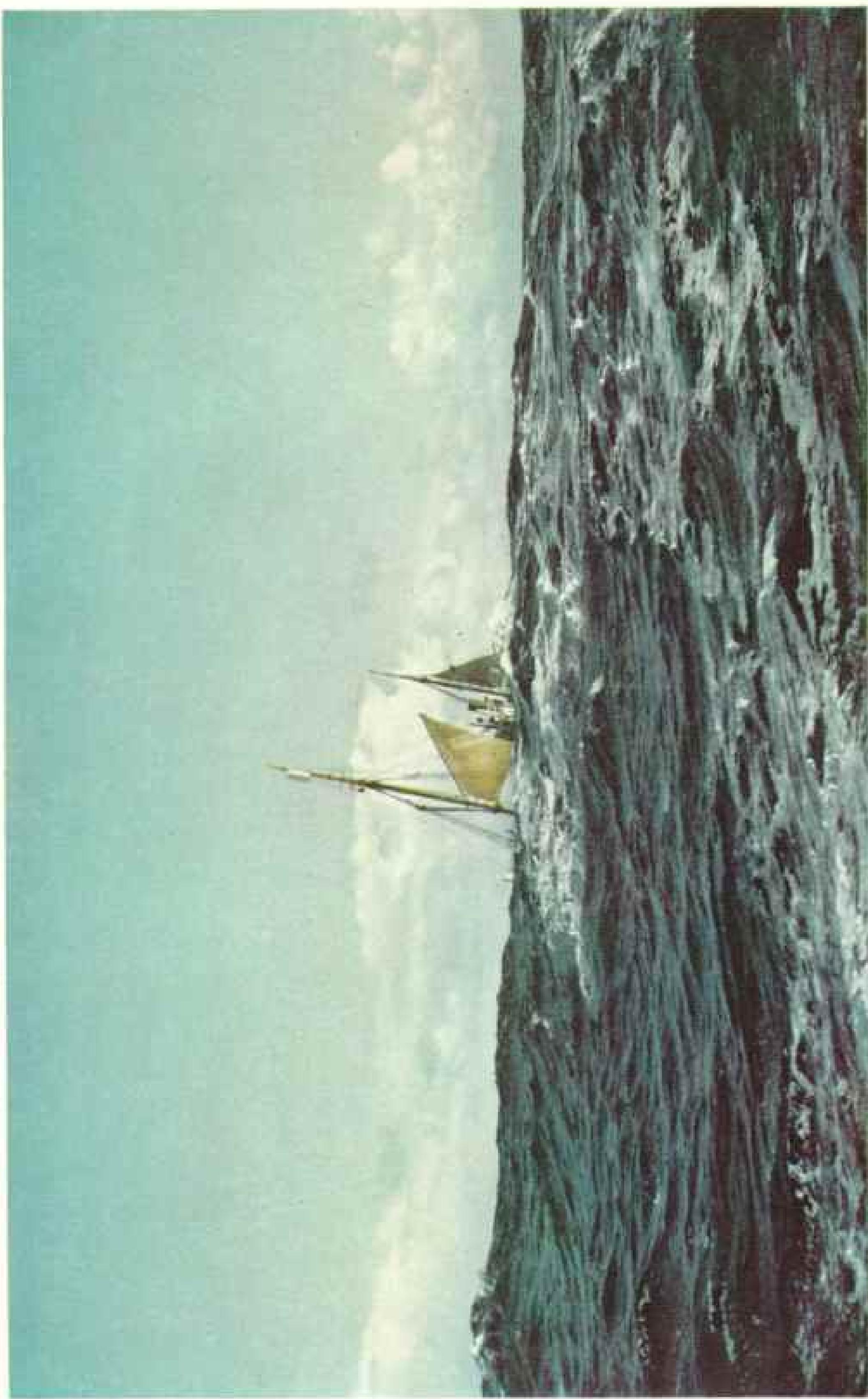
A Forest of Masts Rings Aleund's Peaceful Harbor, Crowded with Fishing Vessels

The busy, many-gabled Norway town is home port for a small sailing fleet and for fishing craft which catch herring, cod, ling, halibut, and other fish. During the recent war it was headquarters of an underground escape service, called the "North Sea Bus," for young Norwegians bound for England.

Courtesy of the Arctic Club

Not a Sinking Ship, but *Kvinnungen* in the Trough of Mountainous Seas. She Sailed Side by Side with Author's Ship to the Arctic From Norway it is a week's voyage to ice fields where seals by the thousand whelp on the floes. Stout little sealing vessels are built of oak sheathed with green heart to withstand buffeting of grinding ice. To the masthead climbs the white barrel of the crow's-nest, vanatae point for the ship's captain while navigating through ice or searching for seals with a telescope. Sail is set to steady the round-built hull in heavy seas rather than to add speed.

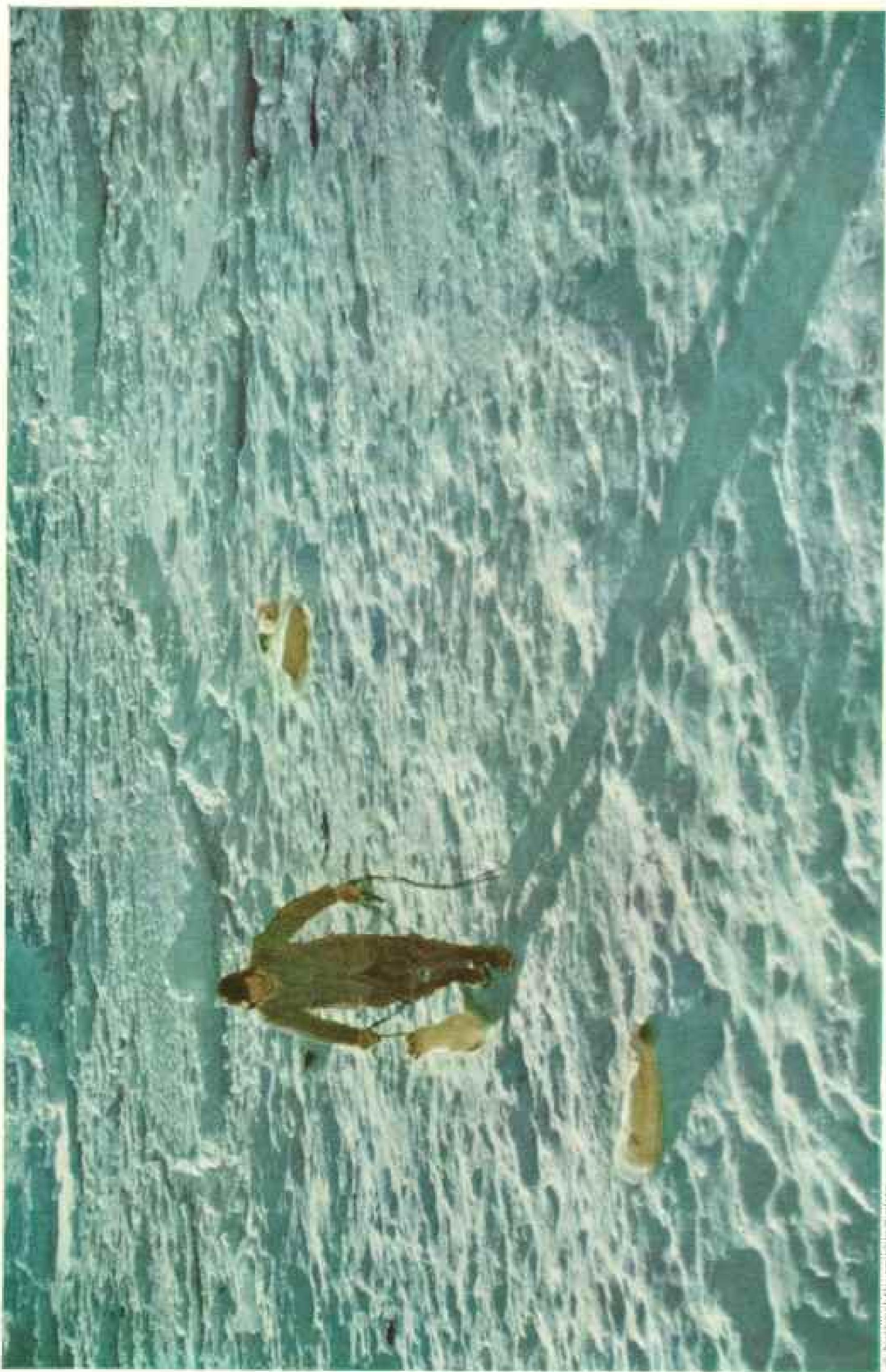
© National Geographic Society



On Arctic Ice, a Norwegian Hunter Harvests Baby Seals so Mildly May Wear a Soft Fur Coat

© National Geographic Society

"Whalebone" a few days old cannot crawl as fast as their parents. Adults often escape in leads between ice panes (top). Ripe with hook makes hunting big.



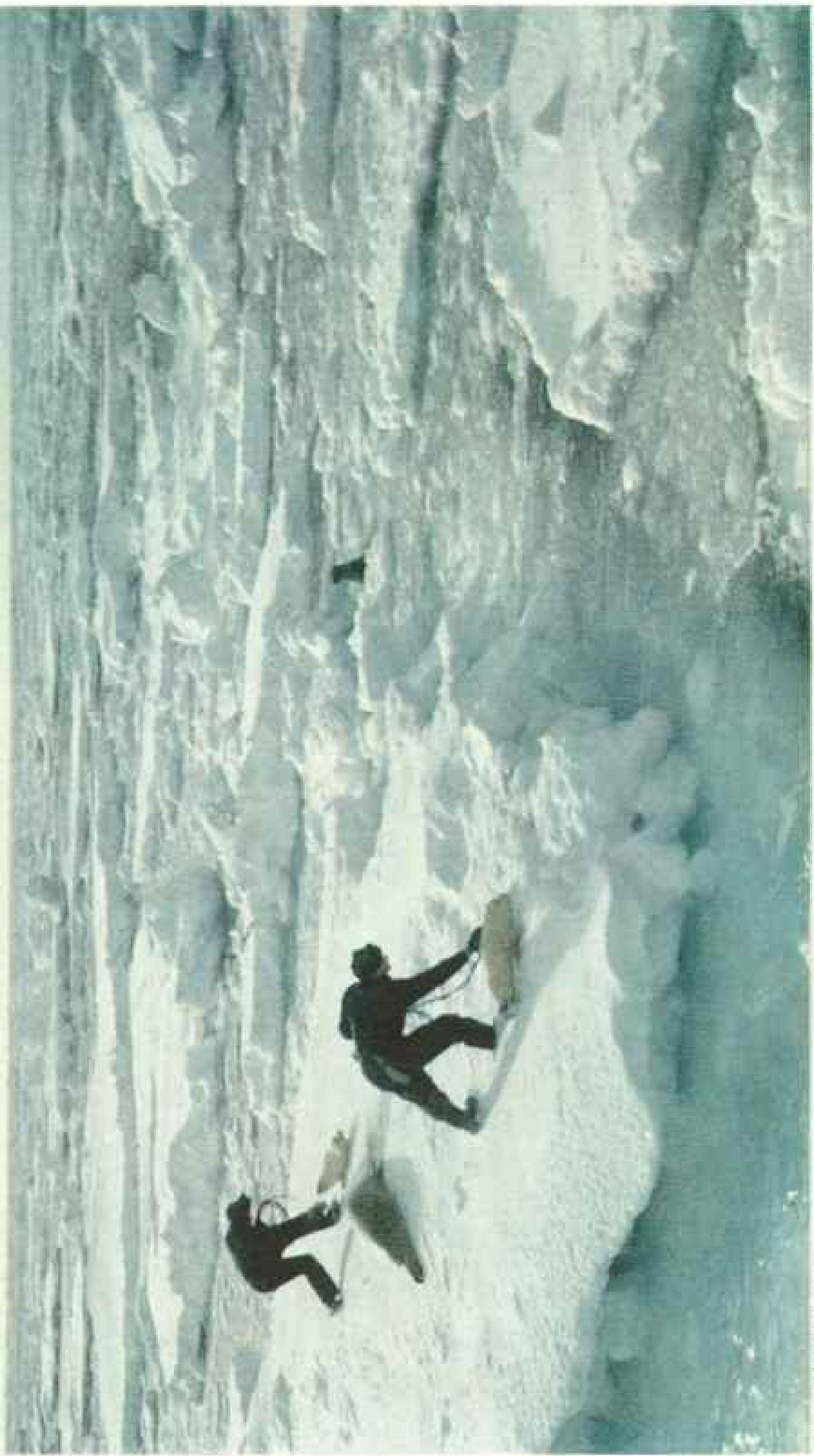


Kotlikinoes by Eric Fischl, Nature
Yelping Wrath as Fluffy Whitecoat Eyes His Captor
Cuddly and lovable, this five-day-old harp seal is at the best age to be taken for fur. The pups lose their valuable woolly coat between 14 and 20 days after birth. During the first two weeks of its life the infant harp lives entirely on mother's milk, which has a very high fat content—as percent, according to the author, compared with about 4 percent fat in cow's milk. Harp seals usually bear a single cub, occasionally twins.



National Geographic Society
Injured Innocence Gives Way to Yelping Wrath as Fluffy Whitecoat Eyes His Captor
Cuddly and lovable, this five-day-old harp seal is at the best age to be taken for fur. The pups lose their valuable woolly coat between 14 and 20 days after birth. During the first two weeks of its life the infant harp lives entirely on mother's milk, which has a very high fat content—as percent, according to the author, compared with about 4 percent fat in cow's milk. Harp seals usually bear a single cub, occasionally twins.

© National Geographic Society
On Desolate Ice Flies of the Norwegian Sea, Min's Need for Fur and Fat Brings Tragedy to Two Mothers and Their Pups
Lonely wastes are often fit for primitive drama. Hunters have killed a mother seal and her cub. Sinner (at left) is about to capture the second youngster. Helpless to save her baby, the other mother (center) lifts her head above the ice to see what happens.



Courtesy of the U.S. Rubber Company

Deft Knife Strokes Separate Sculp from Entrails

Sculps (right, center) are seal skins and adherent blubber. Fat is removed at the home port. It yields a fine oil used in soaps, lotions, and lubricants.

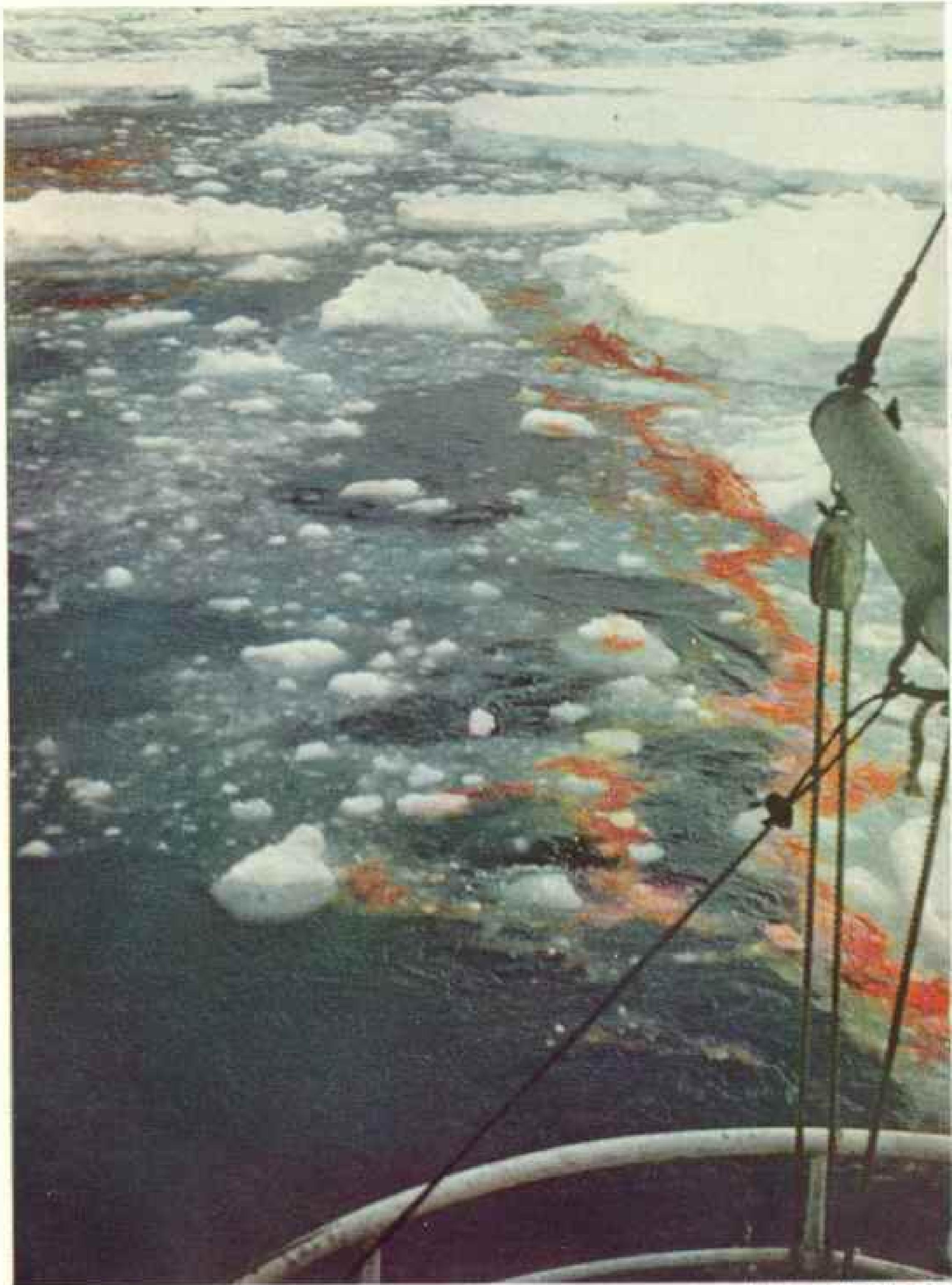


National Geographic Society

Men Need No Gloves Skinning Still-warm Seals

Crew members skin out the quarry soon after capture. Spry frenes on ship's superstructure, but men's bare hands are comfortable. Furry seals are babies.





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Kodachrome by Olof Ernster Backer

Seal Blood Makes a "Red Sea" of Ice-choked Arctic Waters

A seal has been called "a bag of blood and fat." Adult hooded seals weigh up to 800-900 pounds; harp seals are much smaller. The *Folgeret* took 500 seals—half the catch for the whole voyage—in one day! This explains why, at the climax of the hunt, the vessel trails a ruddy wake.

We Survive on a Pacific Atoll

By JOHN AND FRANK CRAIGHEAD

AS WE stood aboard a Navy picket boat, ready for our adventure, we were confident that we had the most enviable assignment in the Navy. Our job was to demonstrate that man, cast away on a dot of land in mid-Pacific, can live almost indefinitely by using his ingenuity and Nature's resources.

Specifically, we were to gather information on edible plants and animals, ways of getting water, travel conditions, disease hazards, native lore, reef and surf conditions, and other data to safeguard the lives of downed Navy fliers.*

To survive in a wilderness, with a minimum of physical equipment, could be an interesting experiment or a harrowing experience. How would we find it? We wondered.

Our island was a low coral formation, one of the many uninhabited specks of land that make up Kwajalein Atoll. Some of these atolls, Kwajalein, Eniwetok, Majuro, Mill, Jaluit, and others, stretch over 800 miles of ocean to form the Marshall group.† All of them together contain about 74 square miles of land (map, page 74).

Each atoll is composed of an irregular chain of islets around a central lagoon. The islets are separated by continuous shallow reefs with a deep channel or entrance into the lagoon, usually at the leeward end of the atoll.

An Islet Shaped Like a Dumbbell

This we knew about our islet; what we could see was still more interesting. We could survey it all at a glance. It was shaped like a dumbbell, with the two broad ends densely covered by vegetation and the narrow central strip opening to a coarse sand beach strewn with coral boulders.

A small lagoon nestled between the projecting ends of the islet and emptied into the ocean by a channel through the reef.

A billowy cloud hung over the coconut trees, shimmering heat waves distorted the outlines of objects on the beach, and a rough surf pounded the frontal reef. Now that the war was over it was possible to appreciate the natural beauty of our island.

There were the graceful coconut palms swaying over sandy beaches, the aquamarine blue of the lagoon, the emerald green of tropical vegetation, the shrill cry of white terns and noddies, the booming of the surf, and the gentle whisper of northeast trade winds.

Five of us were going ashore—John J. Lynch, Merle Stitt, Goniske, a Marshallese native, and the authors. As we gathered up our meager equipment our attention shifted from the aesthetic to the practical. We had to live with that island. A glance took in the number of coconut trees; they would be our staff of life. The nut crop was poor. The trees were thin and tall, which meant a long climb for a drink.

Apparently there were no breadfruit trees, but the reef looked productive.

The little lagoon teemed with colored reef fishes, and back of this were many deep tidal pools that served as natural traps for varied sea life. All in all, foraging prospects looked good. We were anxious to get ashore.

We bounced into a rubber raft. A seaman threw our line free and mumbled to a companion, "They can have it." We were on our own.

A Lesson from Earlier Mishaps

Many a castaway in a rubber boat drowned in the surf or received severe coral cuts by landing on the windward side of an island. We pulled toward the calmer lee shore on the lagoon side of our islet. Our raft rode through the surf on the crest of a small wave and when it hit the shallow reef we jumped overboard.

The picket boat was a gray speck on the horizon by the time we had waded the reef and eased our raft up on the beach.

Unloading was simple. Besides personal gear such as a machete, sheath knife, pocket fishing kit, underwater goggles, magnifying glass, flashlight, and tennis shoes, we had a first-aid kit, several cameras, notebooks, and a few reference books on plant and animal life of the region.

Then, too, we had Goniske, who had survived on the islands during the Japanese occupation. We had included him in our party as a sort of reference book from whose wartime pages we hoped to learn some new tricks.

The natives of any area know from generations of primitive living the simple, easy ways of utilizing the resources at hand. Goniske was no exception. Besides, he proved to be a real companion and our most useful piece of "equipment," a skilled coconut husker.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "They Survived at Sea," by Lt. Comdr. Samuel F. Harby, May, 1945.

† See "Map of the Pacific Ocean and the Bay of Bengal," issued as a supplement to the NATIONAL GEOGRAPHIC MAGAZINE, September, 1943.



Kwajalein, a Minute Dot in a Watery Waste, Lies in the Center of the Marshalls

Total land surface of the 34 atolls and islands is estimated at 74 square miles, about one-sixteenth of the area of Rhode Island. Total sea area is roughly 375,000 square miles, or about one and one-half times the size of Texas. Spaniards discovered the archipelago in 1526, and in 1885 it became a German protectorate. Japanese rule began in 1914 and ended early in 1944, when American forces landed. Like the Marianas and Carolines, the Marshalls are now under United States Navy civil affairs trusteeship.

Our immediate tasks were to select a camp site and to reconnoiter. Accordingly, Lynch and I (John) set out to explore, while Goniske, Merle, and Frank determined where we could construct our palm beds and shelters.

Selecting a Camp Site

An hour of easy walking took us around the island, enabled us to cross it twice, and gave us ample time to wade the reef. When we returned to the raft, Frank and Goniske were busy cutting palm fronds. Their camp site was a good one—shaded from the noon sun and open to the trade winds. Coconut trees, our main source of food, water, and shelter material, were directly behind.

The lagoon lay close to the left, while off to the right were the tidal pools. Firewood of old coconut husks and dry guettarda limbs was easily available.

Our site was a beautiful spot between the palms, but more important, its nearness to all the essentials would lighten our work and enable us to conserve energy.

Conservation of energy is essential to survival under primitive conditions. The task of supplying oneself with food and water, constructing shelter and needed utensils is a full-time exhausting job under the best of conditions.

Hard work requires adequate fuel for the body, and in the primitive life the attainment of food and water is tiring. It is a vicious circle that never relents.

The "lazy native" has by necessity learned to satisfy his basic needs in what appears to be an easygoing way. First rule in survival is to take it easy and make tasks light.

We described the results of our hurried survey to the others. As we had surmised, there was no breadfruit, one of the food staples of the Marshallese. For plant food we could depend on the coconut, the starchy tubers of the tacca plant (Polynesian arrowroot), the golden keys of the pandanus (screwpine) "cone," and if necessary the hard kernel of the ochrosia fruit. We found an ample supply of sprouted coconuts, which prepared in various ways would be our plant staple.

Evidence of Coconut Crabs

Small piles of coconut husks among the coral boulders indicated the presence of giant coconut crabs. There were no signs of any mammals and we had expected none, as bats are the only mammals indigenous to these oceanic islands.

The little white terns and the noddies were nesting. Their eggs would be edible, but we had no intention of using them for food.

The lagoon was full of reef fishes and giant clams. The reef contained various types of edible mollusks. In the tide pools we had seen green parrotfish, needlefish, milkfish, mullet, and a small shark. There was no ration on meat, but we had to catch it.*

Food had not been our only concern. On the ocean side of the island, back of the frontal beach, we had found a sandy depression that appeared to be a promising spot to dig a beach well. We needed fresh water to supplement the green coconut juice and to use in cooking. Rain would help out, but it was an uncertain source.

We had likewise observed the various plants, for in one way or another almost every one had a special use. The narrow-leaved *pemphis* along the lagoon shore had extremely hard wood that made excellent spears and, like our oak, burned to hot coals. We could use it for broiling fish or lobsters.

The *pandanus* leaves and prop roots contained tough fibers for lashing shelters. Dry dead limbs from the *guettarda* tree could be used in making fire by friction (Plate VIII). The velvety leaf of the *tournefortia* could be used to wrap food for cooking in earth ovens.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Net Results from Oceania," by Walter H. Chute, March, 1941.



U. S. Navy, Official

Nimbly, They Scamper Up and Down a Wind-bent Coconut Palm in a Marshallese Version
of "Tag, You're It"

Climbing the tree is easier than it looks. The youngsters use notches cut by adults who go aloft twice daily to tap flower spikes for their sweet sap, which ferments into toddy (page 91).



John and Frank Craighead

Everyone Gets a "Drumstick" When Octopus Is Served

As prepared by their Marshallese companion, the authors report, this dish was more palatable than it looked. After cooking, the skin with its suction disks was stripped off, leaving an opaque, white, rubbery meat. Members of the Navy party pursued the cephalopods to their underwater lairs (page 89).

Rosettes of shiny scaevola leaves grew close to the sea, forming a light green fringe around the islands. These leaves made a restful bed when covered with palm fronds (Plate V). They served the function of our spruce and fir at home.

The seaside purslane growing in the sand made an excellent green cooked or raw. The coconut had more uses than all the other plants combined.

Cocoanuts for the First Meal

Our first meal was a simple one consisting entirely of green coconuts. Had we been injured or exhausted, as was the case with many a survivor, we might have been forced to quench our thirst from rain water caught in the coral pockets, and perhaps would have had sufficient energy to husk a sprouted coconut and eat the sweet fluffy core.

Even this minimum expenditure of energy would have been an effort.

Having the advantage of starting out in good condition, we passed up the tiny pockets of warm water in favor of cool, refreshing coconuts.

Frank and Goniske each climbed a tree, "walking" up them very much the way one would climb a tree with spurs (Plate I). They used the rough frond scars to give purchase to hands and feet. Soon it was raining green nuts. A few broke open, spilling the clear fluid, but most remained intact.

When the barrage subsided, Lynch and I proceeded to open the nuts with accurate strokes of the machete. They were excellent drinking nuts, containing a soft thin layer of white meat and a pint of clear, sweet fluid that completely filled the cavity.

After draining a nut we split it with the machete and, using a sharp shoulder of the husk for a spoon, scooped out the soft flesh. Lunch was two nuts apiece with three for Goniske. One can drink freely of the juice of green nuts without ill effects, but the milky juice of the ripe nuts will sometimes cause diarrhea if taken in excess.

Likewise, the soft, flaccid meat of green nuts is far more digestible than the sweet, oily meat of the ripened nuts and in the long run remains more palatable.

We scarcely knew Goniske, yet we could see that he was brimming over with happiness and enthusiasm. A husking stick was needed, and without a word from us he contrived one. He was soon ripping off the tough husks of sprouted coconuts with a precision and ease that momentarily brought us from our various chores to watch with envy and admiration (page 78).

To appreciate Goniske's skill you have to have had experience opening coconuts without a knife or machete. Without a knife there are only two feasible methods of husking them. One is to bash the pointed end of the coconut on a rock or log until brute force triumphs by splitting the husk.

The other way is to use a hard, sharpened stick firmly anchored in the ground to pry off the husk in strips. This requires both force and skill, the amount of force diminishing with practice.

A novice may work for hours and never open a coconut. Goniske did it in seconds. It is not strange that many a downed airman in need of food and water told of passing up coconuts because he could not husk them. Others never lived to relate such simple tragedies.

Throughout the afternoon we gathered palm fronds with which to construct our beds and shelters. A bed and a roof, for a man faced with the necessity of getting food and water and yet conserving his strength, may appear to be a luxury. Under the most critical conditions it would be, for a really exhausted man can sleep anywhere.

In the long run, however, sleep is as necessary as food and drink. With adequate rest a man conserves energy, thinks more clearly in emergencies, and maintains the courage and spirit that alone may bring him through.

Frank and Merle snapped off clumps of scaevola leaves and by inserting the butt ends into the sand laid the foundation of our beds. Goniske and I cut palm fronds, split them along the midrib from tip to butt, and laid them over the scaevola leaves in such a way that the split midrib formed the edge of the bed and the leaflets overlapped in the middle.

Five or six fronds formed a soft, springy bed. These were protected by a shelter of densely shingled, split palm fronds. Our thatched leantos were the essence of simplicity yet adequately rainproof (Plate VI).

Fresh Shark for Supper

We had not taken time to gather any substantial food and now felt the need of a good meal. Although ready for our palm beds, we knew our working day was a long way from being over. At noon Lynch had started a fire with a magnifying glass and a dry coconut husk. Fortunately we had kept it going, for now there was a heavy haze.

Frank and Merle went after more green nuts, Goniske dug an earth oven, while Lynch and I tried our luck in the tidal pools.

The small shark we had seen on our reconnaissance would be our best bet. We waded



John and Frank Craighead

To an Expert, Opening Coconuts Without a Machete Is Easy

Navy annals record cases of wartime castaways going hungry because they did not know the simple technique demonstrated here. Goniske pries off the tough husk in strips by thrusting the nut downward against a hard, sharpened stick anchored in the ground (page 77).

into the clear, refreshing water and slowly herded the shark into a shallow arm.

A sudden rush forced him practically to strand himself on the coral, where a quick stroke with the back of the machete snapped his vertebrae.

Strange how much better we felt now that supper was a certainty.

What heights of feeling some survivors must have experienced at obtaining their first food in many days and knowing that at least for a little while longer there was still hope, still a bare chance that they would come through!

These pools with their trapped fish were emergency larders. They represented a cer-

tain amount of security amid the uncertainty of primitive living. Thus, when we had speared a large green parrotfish, we decided that we had our limit.

In localized areas parrotfish are thought to be deadly poisonous at times because of toxic plants and animals they consume.

A lone survivor would do well to pass up such a meal, but our purpose was to experiment, and we felt that Goniske might shed some light on its edibility in these waters. He grinned when he saw our catch; apparently the parrotfish was a delicacy.

Goniske Plays Chef

We were about to clean the fish when Goniske indicated that he would prepare them. He laid each fish on a bed of heated coral stones—laid them on intact, uncleared.

He did not touch the leathery skin of the shark nor remove the large scales of the parrotfish. He didn't even gut them.

It was a lazy stunt if ever there was one. We were ready for anything that saved effort,

but this seemed to be stretching the point. But we all hid our feelings and held our tongues. We knew that Goniske had cooked fish nearly every day of his life and curiosity alone would have kept us silent.

Before long he pronounced the fish ready. He removed the charred skin and cut the fish into sections. The skin and scales had kept the flesh moist, the viscera only added to the flavor, and after the first taste we conceded it was better than our broiled fish would have been, and so simple.

The parrotfish was delicious, but just in case Goniske should be wrong about its edibility in these waters, one of us acted as a control and passed up the delicacy.



Staff Photographer W. Robert Moore

Fortunes of War Make Uncle Sam, Instead of the Mikado, Their Guardian

Future welfare of Marshallese children and adults is guided by United States Navy civil government officials. For youngsters aged 6 to 14, attendance at Navy-supervised schools is compulsory. Subjects include English. Under Japan's 30-year rule, the islanders received limited schooling from American missionaries.



John and Frank Craighead

Shore Dinner Coming Up! Giant Clams of the Pacific Have Built-in Dishes

After a hunt on an atoll reef, John Craighead removes the contents of three *Hippopus* clams. In his left hand he holds the most palatable portion—the large adductor muscle, which has a plantlike taste. These mollusks were steamed and served in their own shells (page 80).

Before starting to cook the fish we had covered the hot stones of our pit fire with tournefortia and young coconut leaves. On top of these we placed sprouted nuts, put on another layer of leaves, and covered the pit with a foot of sand (Plate VIII).

In two hours the confined heat from the hot rocks baked the coconuts. For our second course we dug up these nuts.

Rotating one in the palm of my hand and successively striking the three longitudinal ribs, I split the nut open, exposing a yellowish-white core about the size of a small potato. It had the taste and consistency of a boiled yam very slightly flavored with soap.

If unopened, cooked nuts will keep three or four days. They are nutritious as well as palatable, since the oil melts into the flesh, forming a rich food.

Goniske Wins Respect

Long after dark, dead tired but no longer hungry, we flopped down on our palm beds. Frank and I shared the larger of the two shelters with Goniske.

All our lives we had been learning to live outdoors. We had roughed it in many parts of the world, but in this environment Goniske was admittedly our superior. We knew and felt it, but he didn't. He hesitated to sleep under the same roof with us and did so only after much persuasion. At supper he waited for us, expecting to eat when we had finished.

We served him equal shares and offered him a second helping; he accepted only when certain we did not intend to eat it ourselves.

We were determined that on our island, at least, he was an equal and would be treated so in every way.

That night Goniske realized he was one of us, and he knew we respected him. From then on nothing was too difficult for him to do if we wanted it done. The knowledge he had accumulated throughout a lifetime was at our disposal.

The following days were full of new interests and new adventures; yet all our energies and activities were directed toward the one problem of foraging.

Very few places in the world are more favorable to such primitive existence. The little island contained all we needed, with most of our wants supplied from the versatile coconut tree and the reef with its teeming animal world.

More than half the trick of obtaining food lies in knowing what to expect in a given area and where and how to look for it.

Each form of life on the reef has its own place where it prefers to live. The brilliant

reef fishes are easy to see but difficult to catch. The less conspicuous foods, such as various types of mollusks, crabs, and shrimps, are not easy to locate.

Through necessity we soon learned the best places to gather the delicious cat-eye snails, the giant clams (*Tridacna*), and the large, lustrous cowries. We knew where to expect octopus and what sections of the reef offered suitable homes to spiny lobsters and coral crabs. Much of our time was spent on the reef and in the small lagoon (Plate VII).

Spearing the Giant Clam

One morning four of us donned goggles and with our fire-hardened pemphis spears and sheath knives started out to gather giant clams. We had found two types of large clams: the *Tridacna*, which attaches itself to coral formations and becomes partially imbedded in the living coral, and the *Hippopus*, which is free to move about.

Some specimens of *Tridacna* are known to be a yard long, two feet high, and weigh over 500 pounds. We had heard tales of natives inadvertently stepping between the giant jaws and being held below the surface in that viselike grip.

We swam on the surface, peering down into the depths until we spotted the undulating, iridescent mantle of a small *Tridacna*.

Goniske rolled over porpoiselike and headed down, knife in hand. I followed with a heavy spear. A light touch on the purple mantle started the valves slowly closing. The clam was a small one, about 40 pounds, and was well imbedded in a large coral head.

After looking this situation over we came up for air, starting down again only when the clam had opened up.

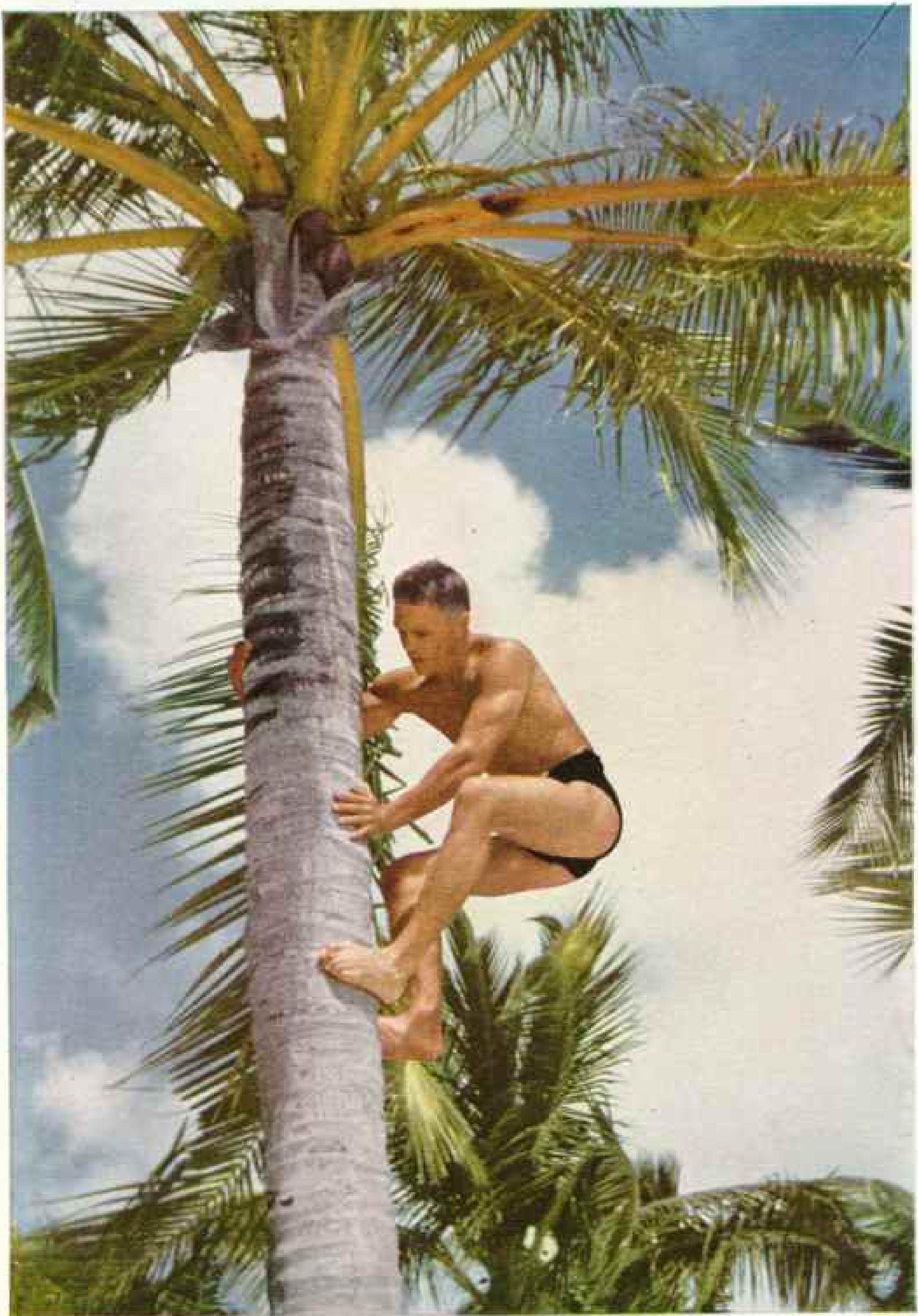
The power of the *Tridacna*'s shell is tremendous, and there is reason to believe that men have met death helpless in its stony grip. However, the valves close slowly, and a cautious man has little to fear.

Swiftly Goniske's knife slid between the mantle until his wrist was deep within the clam. A lightning slash the length of the open valves cut the great adductor muscle, preventing the clam from closing up. A few more quick strokes completely severed it. Taking turns, we swam down and pried with the heavy spear until the clam was free.

Spot Marked for Future Reference

We had found the simplest method of preparing these clams was to steam them in their shell and then use the valves, or shell halves, for dishes (page 79). We attempted to tow this one ashore. A hundred feet of

We Survive on a Pacific Atoll



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Photographs by John and Frank Craighead

Up He Goes! Coconut Palms Reward Castaways with Food, Clothing, and Shelter
Every muscle does its bit as John Craighead works his way up a tree on an islet of Kwajalein Atoll.

hosted come by Jaron and Frank trained

Under Cotton-wool Clouds, an Atoll Islet Gleams Like a Bit of Jade in a Turquoise Setting

The authors and companions, "cinea pigs" in a Navy survival experiment, spent seven months on such dots of land in the Pacific. This air view shows live coral in a line of reefs paralleling the island. Dead coral, pulverized by pounding surf, forms the beaches.

© National Geographic Society



Courtesy to Jim and Frank Graham

No Shortages or Priorities Here! Castaways Get Their Home-building Materials from Nature's Stock Pile

Frank Graham nests beside a shelter shaded by a tamarind tree and exposed to cool trade winds. Sloping roof was thatched horizontally with split palm fronds, covered with whole fronds laid vertically. A rubber raft (left) brought the party ashore from a Navy vessel.





Pandanus, or Screw pine, Offers Sustenance to the Resourceful Forager

Its seeds distributed by ocean currents, this plant is found on most Pacific islands. Merle Stitt chews a section of its conelike fruit. Leaves make weaving and thatching material; from the prop roots comes cordage.



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Colorframes by John and Frank Craighead

Tapped Like Sugar Maples, Coconut Palms Yield a Sweet, Refreshing Sap

Liquid drips into a bamboo joint after the end of a flower spike has been severed and bound to prevent the flower from opening. The juice quickly ferments into a stimulating toddy, or "jugeroo."

We Survive on a Pacific Atoll



Micronesian "Know-how" Proves Handy in Weaving a Palm-frond Sleeping Mat

The authors found Goniske, their Marshallese companion, a walking compendium of tips on primitive survival. Here he deftly fashions split coconut fronds into bedding, to be placed over a layer of leaves.

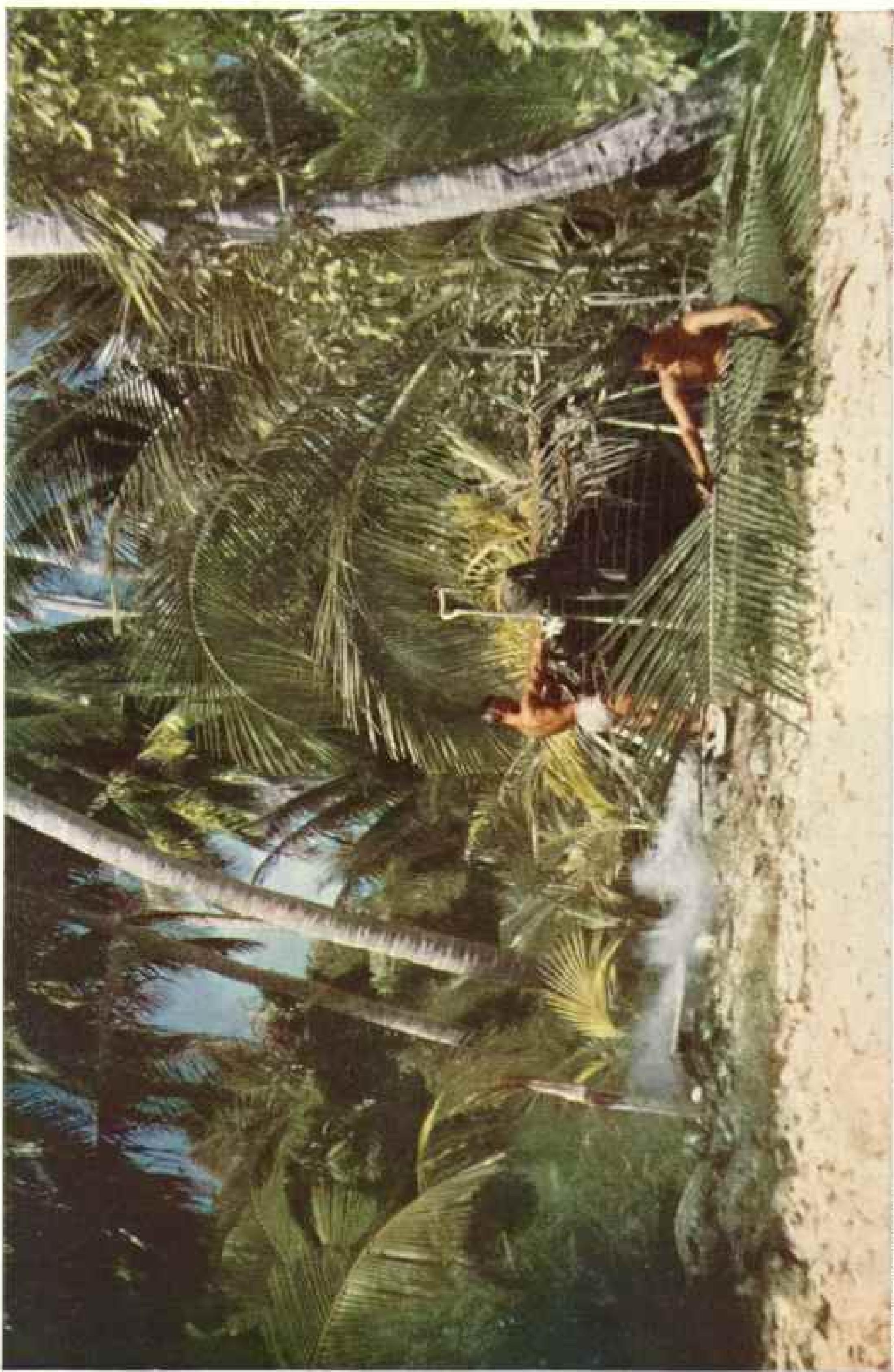


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Photographs by John and Frank Craighead

Coconut Crab, Broiled in a Coral Oven, Made Castaways Feel Like Gourmets

These big crustaceans were captured at night, when they emerged from rock crevices to feed on freshly opened coconuts placed as bait. One large specimen made a meal for five. Their meat tastes like lobster.



© National Geographic Society

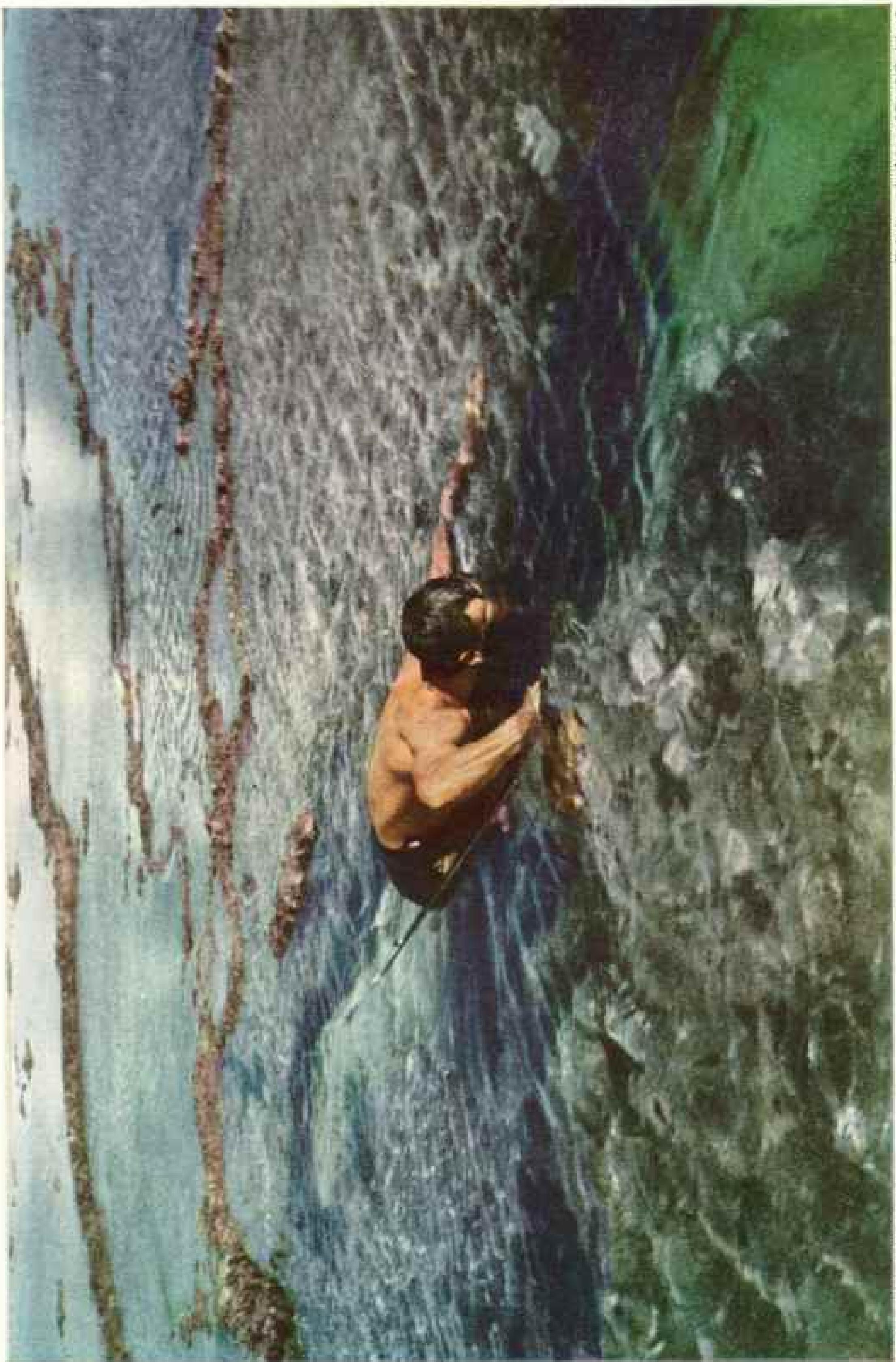
An Atoll Housing Project Rises in a Lush Tropic Setting Fanned by Pacific Trade Winds

John J. Lynch (foreground) weaves a palm-thatch shingle while Frank Craighill places another on a two-man shelter. With proper knowledge and simple equipment, say the authors, a castaway has a good chance of living to tell about his experience.

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Spine in Hand, He Peers Through Goggles at an Underwater World Teeming with Edible Fish
The Island reef, here investigated by Frank Craighead, was the source of much food for the Navy custaway. Parrotfish, considered poisonous in some localities,
they ate without ill effects. They also dined on shark, octopus, giant clams, and spiny lobsters.

Widely used by John and Grace Craighead





Baked in an Earth Oven, Coconuts Taste Like Soap-flavored Yams

Frank Craighead places leaves over the nuts; next comes a covering of sand to confine the heat. The oven, one of the oldest and simplest cooking devices, consists of a hole lined with heated rocks.



© National Geographic Society

Kodachromes by John and Frank Craighead

Making a Fire with the "Marshallese Match" Is No Job for an Amateur

Here Goniske shows how he produced flame in three minutes with the fire-plow. His equipment is two pieces of dry guettarda wood. The plow stick is rubbed against the grooved stick until smoke rises.

gasping for air as we bobbed up and down with our heavy load convinced us that we would never make the beach. Settling to the bottom, we cut the mantle and severed the other end of the valve muscle.

The white ropelike muscle is delicious raw, tasting somewhat plantlike, and with a sweetish flavor. Goniske and I divided and ate it while resting on a coral head. The large, slimy mantle and a small, brown, fatty bag, which Goniske considered the choicest morsel, were put aside for chowder.

Locating several other clams grouped together on a coral formation, we marked the spot for future needs with the marble-white interior of the opened *Tridacna* shell. The smooth reflecting surface stood out as an unnatural object on the lagoon floor.

We had barely completed this task when we heard a call from Frank. I swam toward him while Goniske carried our prize ashore.

Through the clear water I could see a dark column of inky fluid extending from the bottom and mushrooming to the surface. Frank had an octopus at bay. We had caught a number of these grotesque creatures with their parrotlike beaks and strangely piercing stares.

Viewed at close range beneath the water and magnified by refraction, they always sent a chill down my back. I think we all felt a little that way, but they were the best of food prepared *à la* Goniske, and we took every opportunity to capture them.

Through the sepia-tinted water I could see that Frank had planted his spear in one, but as usual the octopus was wedged in a crevice with the sucking disks of all eight tentacles holding fast.

This was not the tremendous deepwater octopus that sometimes measures 25 feet across and could easily drown a man. Such monsters are rarely encountered, but the small reef species averaging three and four feet across are common in all tropical waters (page 76).

However, Frank was about to learn that even these small creatures can be dangerous under certain conditions.

Into the Octopus Lair

The water was scarcely eight feet deep. I relieved Frank of the spear, continuing to hold it pressed firmly into the saclike body of the octopus.

The water had cleared, and as Frank swam down I could see two beady eyes and a pair of snaky tentacles that were feeling their way up the spear. His gloved hand slid down the spear between two roving tentacles and forced

its way into the coral crack to grasp the body of the octopus.

A cloud of sepia burst in his face and rapidly spread, momentarily concealing him from view. Through the spear I could feel the vibrations of a tugging match going on below. Another discharge darkened the water. The struggle continued.

As the inky substance slowly drifted aside, I could see Frank with his hand still in the crevice, his arm entwined by tentacles, his feet braced against a coral block. He was pulling with all his strength.

Suddenly his hand slipped out of the glove and he shot to the surface, gasping descriptive but not complimentary phrases.

With a firm hold on the body but held in turn by the tentacles, Frank had discovered that the octopus had the controlling grip. Caught short of air, unable to open his gloved fist to pull it out of the small hole, he had nearly come off second best.

By enlarging the cavity in the coral we were able to retrieve the glove and extricate the octopus. Immediately it twined its tentacles around Frank's arm, but we knew how to handle him in open water.

Frank quickly slid his free hand down the length of his arm, breaking the tentacles loose just as you would pry a rubber suction disk off a window pane. Before they could fasten again he turned the octopus inside out, rendering it helpless.

Crabs Captured at Night

The nights frequently proved more productive than the days. Many terrestrial and aquatic creatures move around only after dark. The giant coconut crab and the spiny lobster were two delicacies that kept us foraging into the late hours.

During the day the coconut crabs remained hidden in deep coral crevices. We located their burrows by the piles of old coconut husks, baited the area with freshly opened nuts, and after dark captured the crabs as they came out to feed.

There was a sense of expectancy in creeping among the sprouted coconuts and coral boulders, watching for the shine of crab eyes as our light played over the rough ground and dense vegetation. Sometimes the slow, deliberate movement of the big crabs revealed them to us, or again it would be the sound of one dragging a coconut.

The problem was to secure the crab without losing a finger. A large specimen could nip a chunk the size of a silver dollar out of a fibrous coconut husk or crush a good-sized coral stone to powder.

After locating one, our first task was to cut off his retreat. Then one of us would pin him to the ground with a stick while another would risk his hand by grabbing both tremendous claws just back of the pincers. A strip of dry pandanus leaf was looped around his claws and carapace, and thus suspended he could do no harm.

The activity we most enjoyed was catching the spiny lobster. Perhaps it was because a good catch always left us with a sense of achievement. It might have been because the water on the reef felt cool and refreshing, or because we anticipated the delicious meal following a successful lobster hunt.

Sport in a Strange World

These undoubtedly played a part, but for me lobstering was enjoyable because it was a sporting proposition in a strange and beautiful underwater world that consisted only of the narrow beam of my light. Outside the beam wasinky darkness.

My little world moved with me as I swam, constantly revealing new creatures, strangely shaped coral, dark fathomless caverns, the glint of eyes or scales, and then suddenly—it was always unexpected—the gold glimmer of a lobster's eyes.

There are many methods of catching spiny lobsters. The most common practice is to wade shallow reefs at low tide, using a coconut-frond torch. Found feeding in the shallow water, the lobsters are easily captured.

They can be frightened from their daylight crevices with a small octopus fastened to the end of a stick. Seeing this natural enemy invading its home, the lobster backs hurriedly into the open, where it is grabbed by the swimmer.

The most effective method for the reef and waters surrounding our islet was to use a waterproof flashlight and swim among the coral formations until a lobster was sighted. One big advantage of the latter method was that we could catch lobsters at either high or low tide.

Lobstering was always serious business with us, but at high tide it became a real sport. When the channels and pockets were deep, lobsters were more difficult to spot and the littoral currents made underwater swimming hazardous.

To appreciate a lobster hunt you must go on one. Flashlight in hand and fully clothed to protect yourself from coral cuts, you drift with the currents, scanning the bottom as your light reveals it.

You may see the orange eyes of lobsters in three feet of water, looking you squarely

in the face. Or, you may discern the outline of one in the purple, murky depths of a pool.

In either case you keep your light trained on your victim while swimming within grabbing distance. Dazzled by the light, the big crustacean will remain motionless for a few seconds.

A lobster swims backwards, so you reach for him from behind. A swift movement aimed at his stern and your gloved hand catches him amidships as he darts backwards to escape. He starts buzzing and flapping his powerful tail as you shove upward toward the surface. You gulp a lung full of air, bring the fighting lobster against your trouser leg and swim for a coral head.

Clasping your trousers, the lobster ceases to struggle, and you relax your grip while groping for the coconut cloth bag tied to your belt. You jerk him free of your trousers, shove him into the bag, and start cruising around for more.

Should you spot one and make a false move, he darts back out of your light beam and the chase is on.

You dive down along a coral channel, turn a corner, and there far back under a ledge you see burning two tiny underwater cigarettes. A shove off the bottom and you are back to the surface. A wave slaps you off balance and carries you with it.

When you get squared away you are not too sure where your victim is. Down you go out of the wave action, and there is your lobster—still motionless. You calculate the best way to approach him and still get back out from under the coral ledge and up through the narrow channel to the surface.

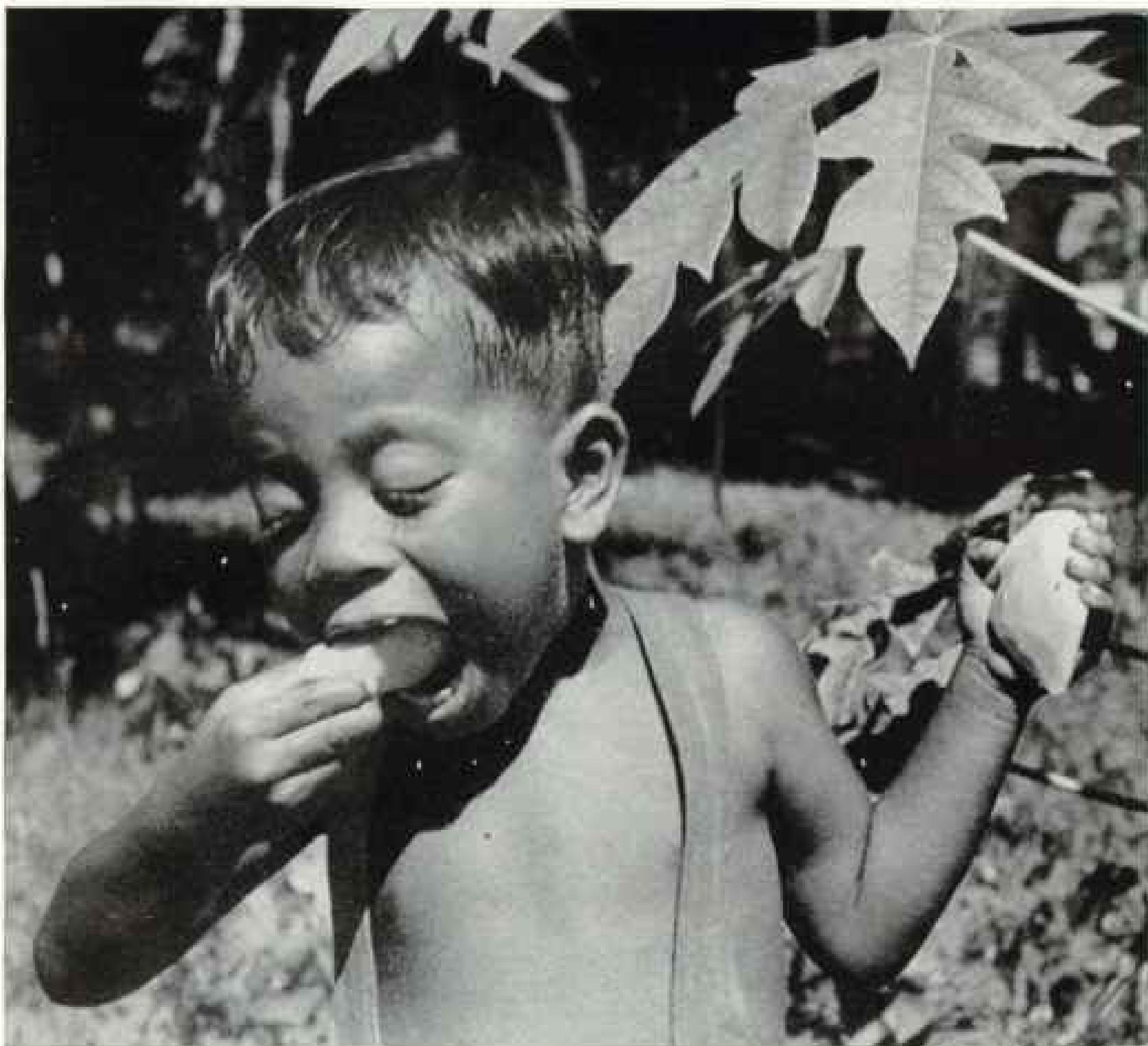
Up you come for a lungful of air, and then down for the "kill." Your light turns the dark water into a fairyland of weird shapes and subdued colors, but your attention is focused on the two burning coals—the lobster's eyes.

Two feet away he looks like an armored tank. You clamp on him, turn around as he "kicks" and buzzes, and then out to the channel and up to the surface.

The fish are less timid at night, and you get an eye to eye stare at the butterflyfish, triggerfish, angelfish, little demoiselles, and large, swooping parrotfish. They are recognizable, though their brilliant colors are much subdued.

Little to Harm an Intruder

When lobsters are scarce, you investigate the varied coral formations. Such grotesque animals as sea cucumbers, spiny urchins, sea slugs, moray eels, and fan worms arouse your curiosity. The reef is truly a new world in the dark, where all familiar life looks different.



John and Frank Craighead

Papaya, Fresh from the Tree, Makes a Juicy Between-meals Snack

Like this Marshallese boy, the Navy castaways found the South Seas equivalent of the cantaloupe a succulent adjunct to their diet. The fruit, a native of tropical America, is rich in the enzyme papain, an aid to digestion. The papaya, easily propagated, has been introduced into many parts of the world.

and many purely nocturnal forms are active.

Peering down into caverns that are bluish purple at the fringe of your light, you wonder what is hidden in the dark depths beyond. From experience you know there is nothing in this strange world to harm you.

Sharks and barracuda seldom wander in beyond the reef, the poisonous stonefish and scorpion fish are rare, stingrays prefer sandy or muddy bottoms, and the moray and conger eels seldom attack unless cornered.

In spite of your assurance you investigate with caution and feel an involuntary chill when a large fish suddenly looms into view.

You return to shore tired, with a few lobsters and a thousand mental pictures of the reef, each one a shaft of light walled in by darkness.

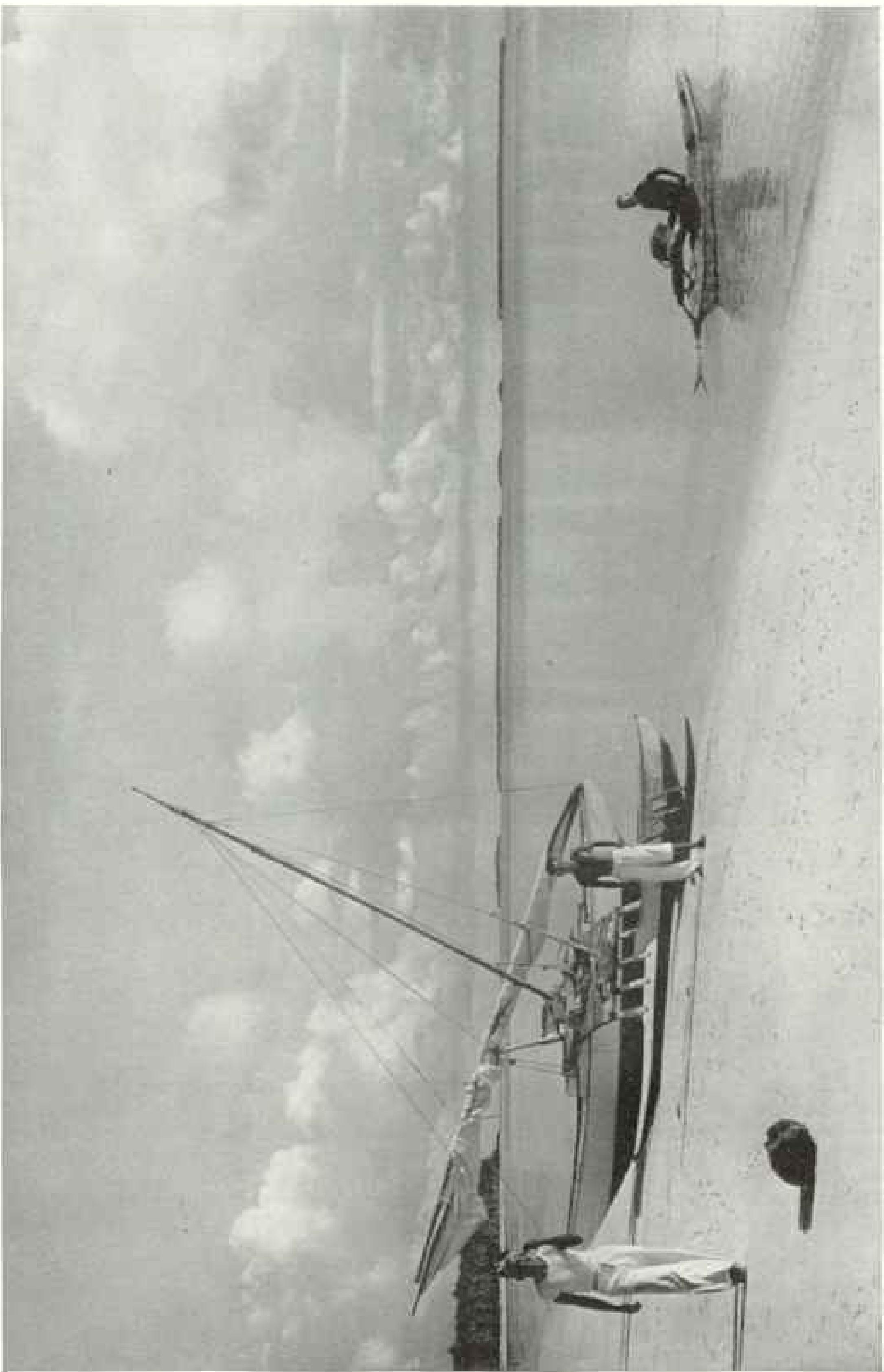
Some of our meals were scanty, and we had to rely on the coconut alone for food and drink. On those days we merely ate to live.

When the reef foraging was good, however, we had regular banquets.

Everyone had a share in preparing the food before sitting down to enjoy it. We were always ravenous, and no meal ever tasted better than those consisting entirely of natural products obtained in primitive fashion.

Frequently there were baked or broiled lobster, octopus steamed in the pit or boiled in coconut cream, raw *Tridacna*, broiled fish, raw or cooked coconut heart, baked sprouted coconuts, some green drinking nuts, and finally a swig of toddy or "jugeroo" (page 75).

This last treat probably involved more work than it was worth, but it tasted fine and



John and Frank Vinalabat

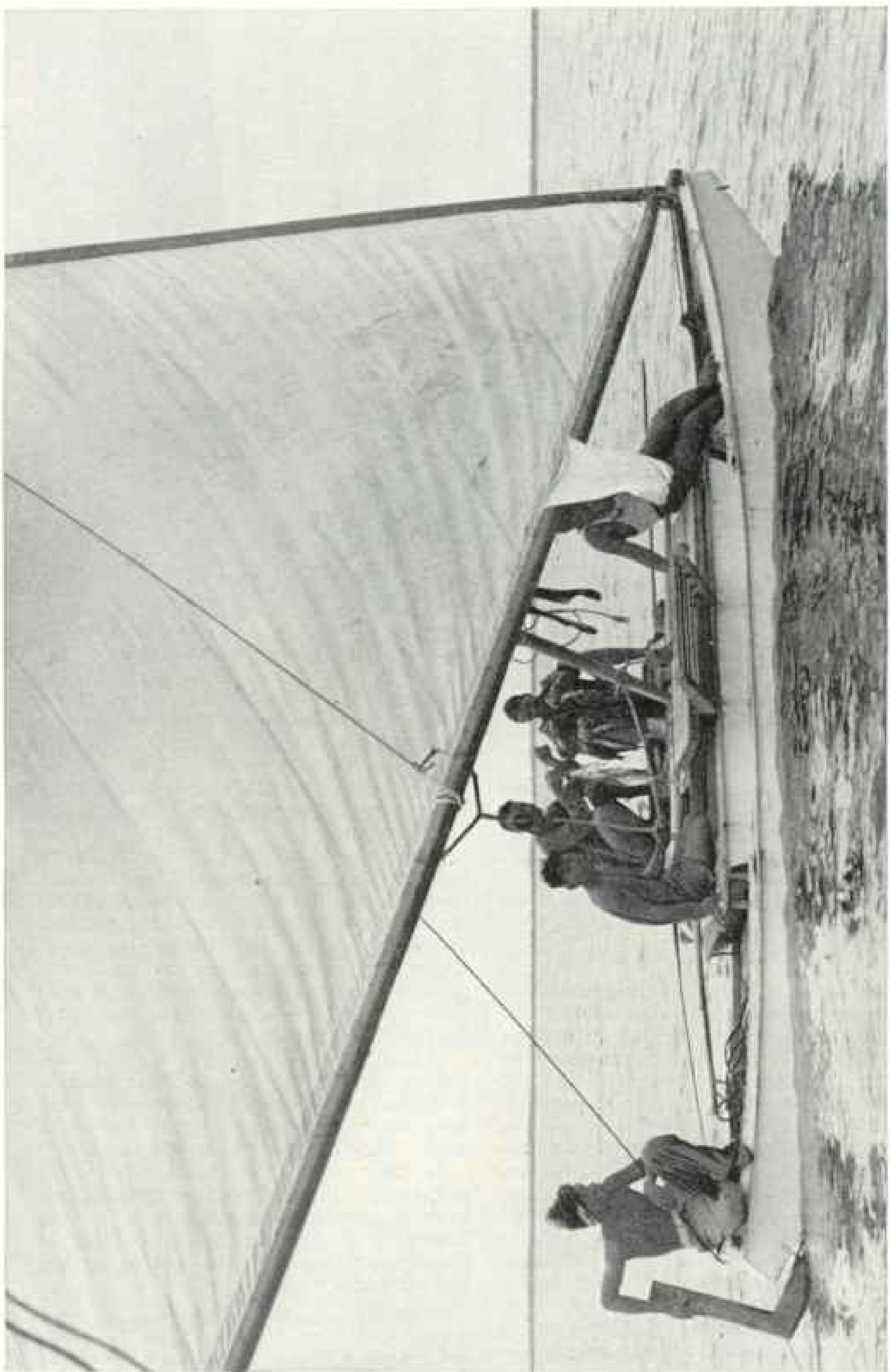
Majuro Atoll's Calm Lagoon Provides a Safe Haven for a Rakish Marshallese Sailing Canoe

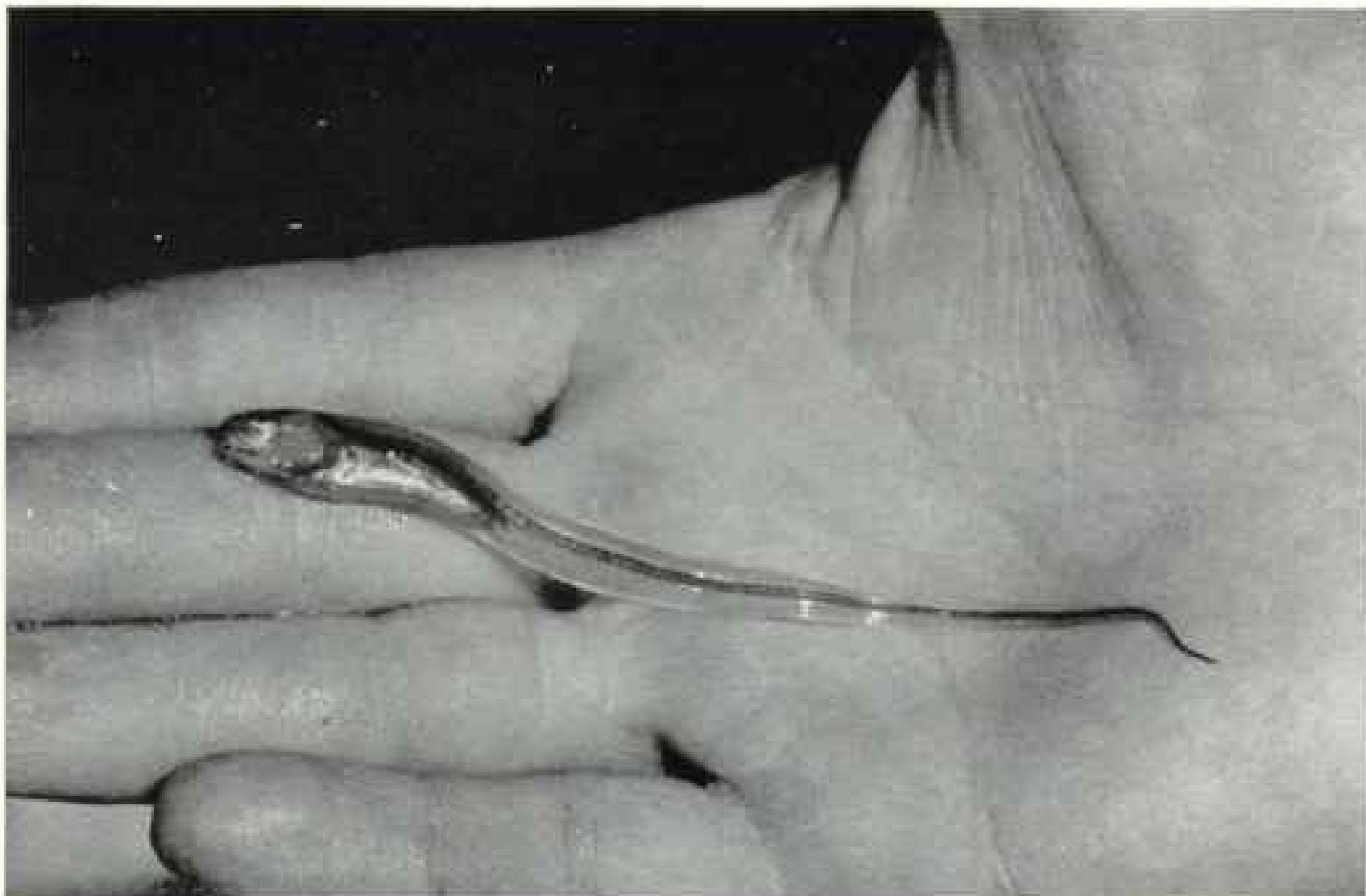
Islanders seldom moor their boats, but haul them up on beaches where marine worms cannot attack the timbers. Hulls are fashioned from hollowed-out breadfruit trunks. Upper portions are made of planks fastened with coconut-fiber cord. Seams are waterproofed with sticky, rubberlike sap of the breadfruit tree.

John and Frank Childard

Reversible Rigging Enables the Swift Marshallese Outrigger Canoe to Sail from Either End

To change direction, sailors lift boom and mast from a socket on the bow and fasten them in another on the stern. The rudder also is switched. John Craighan and John Lynch (center) display their catch after a fishing trip with native hosts.





John and Frank Craighead

Even a Goldfish Has More Privacy than the Tiny, Transparent Pierasfer

All the secrets of this reef denizen's interior are bared like the works of a watch. To escape voracious larger fish, the pierasfer hides in the body cavity of the sea cucumber, or *bêche-de-mer*, and emerges only to feed. Such specimens were among many fantastic creatures encountered by the authors as they explored a watery wonderland in search of food.

always gave us a sense of having attained finesse in the art of survival. It was nothing more than fermented coconut sap which we obtained by tapping the coconut flower spikes. The sweet fluid was collected in coconut or bamboo containers (Plate IV). After standing a day or two it had quite a kick.

Goniske Surprises with a Song

After one such supper Goniske surprised us by unexpectedly singing "You Are My Sunshine." He knew the meaning of the word "sunshine" and had a bare conception of the meaning of a few other words in the song. He had memorized words and tune perfectly.

Sitting beneath his beloved coconut trees, facing the setting sun, he sang with great feeling and understanding, as though the sunshine he visioned was the maker of the coconut, the reef, the rain, the trade winds, the toddy, and all the good things that made up his world. Goniske was completely happy.

Many forces operate against a survivor to reduce the length of time he can live. Food and water are always critical, but other factors such as warmth, shelter, and disease may also be hazardous. Armed with proper knowledge

and simple equipment, a survivor has more than an even chance of living to tell about his experiences.

Over a period of seven months we visited many mid-Pacific islands and found the survival problems much the same on all. In its simplest form, survival on the oceanic islands and along tropical seashores consists essentially of understanding a few basic woodcraft principles and techniques, knowing how to make full use of the coconut, and how to get sea food from the reef.

During the early stages of the war men thrown entirely on their own resources in wilderness areas died of thirst with fresh water only a foot beneath the surface of the sand. They hungered with food in sight.

In many cases the difference between life and death, or between mildly rough going and extreme hardship, was the lack of a little knowledge or training, the simple kind of knowledge that governs the lives of Goniske and his people.*

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Hidden Key to the Pacific," by Willard Price, June, 1942; and "Our New Military Wards, the Marshalls," by W. Robert Moore, September, 1943.

Fun Helped Them Fight

BY STUART E. JONES

IN THE SPRING of 1943 I strolled through a hangar at Langley Field, Virginia, and paused to watch a ground crew preparing a B-24 Liberator for its flight overseas. On the bomber's nose one man had outlined the figure of a girl and, under it, the syllable "Friv." He seemed perplexed.

Finally, he turned to me and asked: "How do you spell 'frivolous'?"

I spelled it out for him.

"You mean an *o* instead of an *i* after the *e*?" he asked.

"That's right," I said.

The artist shook his head doubtfully. I moved on, wondering idly whether he would check my word against Webster's.

A few days later I boarded another Liberator and flew to Port Lyautey, Morocco. Still later, passing through Algiers on my way to Sicily and Italy, I stepped out of a plane at Maison Blanche Airport and was confronted by a familiar sight.

It was only another B-24, squat and formidable like all the rest, but on its nose was painted, in curly letters, *Frivilous Sal*. Over the name was an arresting portrait of *Frivilous Sal* herself.

This was my introduction to the Army Air Forces' informal method of naming and decorating its combat aircraft.

A few of these same aircraft may be seen today, standing in vast, forlorn ranks on lonely fields in the south and west. "Surplus property," or "winged white elephants," the War Assets Administration calls them. Most have vanished; the rest wait until the scrap metal contractor comes with his bulldozers and cutting tools.

Your Saucepan May Have Seen Combat

If you have bought a new saucepan lately, it may contain a bit of aluminum alloy from *Frivilous Sal*.

Some of these obsolete warhorses met a less ignominious fate. They became war memorials. Athens, Georgia, requested the unfinished B-29 Superfortress *City of Athens* from the Air Forces for display in its aviation memorial park. Seattle received *Five Grand*, the 5,000th B-17 built in the Boeing plant there. Los Angeles claimed another famous Fortress, *The Swoose*, piloted by an Angeleno and named for a mythical creature which was half swan and half goose.

Many aircraft nicknames had hidden meanings known only to the men from whose brains they sprang.

For example, what about *Jelated*? The word is composed of the first-name initials of the wives or sweethearts of seven members of a B-17's crew. If the remaining three had had wives or sweethearts, the name would have been longer and perhaps even harder to pronounce.

The "Ball Boys" were a Fortress squadron commanded by Col. Clinton F. Ball. While training at a Texas base before going overseas, the commanding officer named his own B-17 *Linda Ball*, after his infant daughter. The squadron went into combat in planes dubbed *Cannonball*, *Snowball*, *Meatball*, *Fireball*, *Screwball*, *Speedball*, *Highball*, *Eightball*, *Foulball*, and *Scareball*.

The crew of a B-17 piloted by 1st Lt. Robert C. Mason were happy to be known as *Mason's Morons*.

Another B-17 automatically became *Dry Martini* and its crew the "Cocktail Kids," since the pilot was Capt. Allen V. Martini.

The "Cocktail Kids" added spice to the dry language of mission reports when they returned from an attack on a Luftwaffe plane storage and repair center at Romilly sur Seine, near Paris. Back in England, the "Cocktail Kids" reported: "We hit the target sur le schnozzle."

"Yankee Doodle, I and II"

Yankee Doodle was one of the first Fortresses to attract public attention. On August 17, 1942, Gen. Ira C. Eaker, then commander of the Eighth Bomber Command, rode in this 97th Bombardment Group plane in the first all-American attack on a European target, the German-held railway yards at Rouen.

Almost two years later, General Eaker, commanding the Mediterranean Allied Air Forces, flew in another B-17, *Yankee Doodle II*, on the first shuttle mission from Italy to a base in Russia. Axis targets were bombed en route.

Bad Penny was a bomber that always came back. *Patches*, another Fortress, lived up to its name when it limped back to England from an attack on Kassel with almost 1,000 holes and with four of its crew wounded.

In giving their planes distinctive nicknames, pilots and crews seemed to feel that they thereby imparted some of their own personality to the ship and made it superior to all others. This morale factor may have been the reason why the bestowing of nicknames remained one of the few military activities not hedged about by rules and regulations. The official attitude seemed to be: "We don't care

what they call them, so long as they fly them and deliver the bombs."

But the "high brass" was forced to take a hand in the case of *Murder, Inc.* A Fortress by that name was shot down over Germany. Members of the crew, captured after parachuting to earth, were found to have *Murder, Inc.* blazoned across the backs of their jackets. It was an inadvertent gift to the late Dr. Goebbels' propaganda machine, an opportunity to charge that a band of self-styled "murderers" was bent upon wholesale slaughter of German citizens.

A high headquarters promptly directed that in the future no airplane be given a name that could be used to the enemy's advantage.

As for excessively ribald nicknames and pictures celebrating feminine pulchritude, a few half-hearted attempts were made to induce airmen to shun them in favor of more dignified decorations suitable for reproduction in hometown newspapers. These efforts generally came to naught, possibly because more pressing matters demanded attention.

Names were usually chosen by vote of officers and men in accordance with the democratic system under which bomber crews lived and fought. But sometimes the naming was done with happy-go-lucky informality. For instance, a pilot might wake to discover his plane named in honor of the crew chief's best girl, with her picture in four colors on the nose—and might just let it stand.

Fighters, reconnaissance planes, and transports, too, gloried in nicknames, and the custom prevailed in all theaters of war.

Regional pride was reflected by planes labeled *Texas Tornado*, *Arkansas Traveler*, *Brooklyn*, *Connecticut Yankee*, *Idaho Potato Peeler*, *Maryland*, *My Maryland*, and dozens of others.

Comic strips, favorite literature of the GI's, inspired many decorative motifs. One Fortress squadron named its bombers in honor of *L'il Abner*, *Daisy Mae*, *Moonbeam McSwine*, and the other citizens of mythical Dogpatch.

There were many *Sad Sacks*, tributes to the popularity of the harassed little soldier who suffered his weekly humiliation in Sgt. George Baker's *Venk* cartoons.

Likenesses of Sgt. Bill Mauldin's cartoon characters, "Willie" and "Joe," also became airplane adornments. A medium-bombardment outfit based on Corsica called itself the "Dogface Squadron" because the commanding officer had been a "dogface," or infantryman. Mauldin executed a special series of "Willie" and "Joe" drawings for the unit's B-25's.

There were dozens of planes named *Snafu*, a GI expression which has passed into the

American language. One of these, a B-17, later was rechristened *We the People*. In more than thirty missions from its English base, it never carried exactly the same crew twice, and no crewman was ever wounded.

One B-26, *Idiot's Delight II*, after smashing targets in France just prior to D-Day, was badly shot up by a swarm of Focke-Wulf 190's. The pilot, Flight Officer Frank M. Remmle, polled his crew on the interphone—and they voted to stay with the ship. By skillful manipulation of his remaining controls, Remmle landed safely at an emergency field.

Other Marauders which piled up scores of missions, often coming home full of holes, were *Incendiary Mary*, *Frisco Kid*, *Missouri Mule*, *I Idaliza*, *Cursed Commando*, *Shu-Shu Baby*, *Satan's Sister*, *Impatient Virgin*, *L'il Po'kchop*, *Lady Halitosis*, *Sixovus*, *Nude Prude*, *Mild & Bitter*, *Bossy Lassie*, *Flak Bait*, and *Pappy's Pram*.

"No-Name" Tribute to Individualism

A B-17 became known as *No-Name*. Its crew was composed of ten rugged individualists. Each had a name he wanted to paint on the Fort's nose. None would give in.

Delta Rebel, with a goateed colonel painted on its nose and a crew of men from the Deep South, fought the first rounds of the air war in 1942. *Delta Rebel II* carried on into 1943, until her pilot, George Birdsong, went home to Mississippi. Veteran crews refused to take over the ship. "George used up all her luck," they said. A crew newly arrived from the States took the *Rebel* on their first mission—and "parachutes were seen to open."

One of the most indestructible bombers was the B-17 *Hell's Angels*. It wore out sixteen engines, five sets of brakes, three landing gears, countless tires, superchargers and oil-cooling systems. *Hell's Angels* outlasted two combat crews, but came home for a morale tour with its original ground crew of six sergeants, four of whom had painted girls' names on the engine cowlings.

As the war in Europe drew to a close, inventiveness declined and more nameless planes appeared, their metal shining and bare of camouflage paint. One new bomber arrived in Italy with the legend *Eat at Joe's* on its nose—a sort of tired comment on the whole practice of nicknaming airplanes.

After V-E Day, the Air Force units in Europe began packing for redeployment to the Pacific. Their plans—and the world's future—were changed when atomic bombs fell on Hiroshima and Nagasaki from a couple of Twentieth Air Force Superfortresses named *Enola Gay* and *The Great Artiste*.

Fun Helped Them Fight

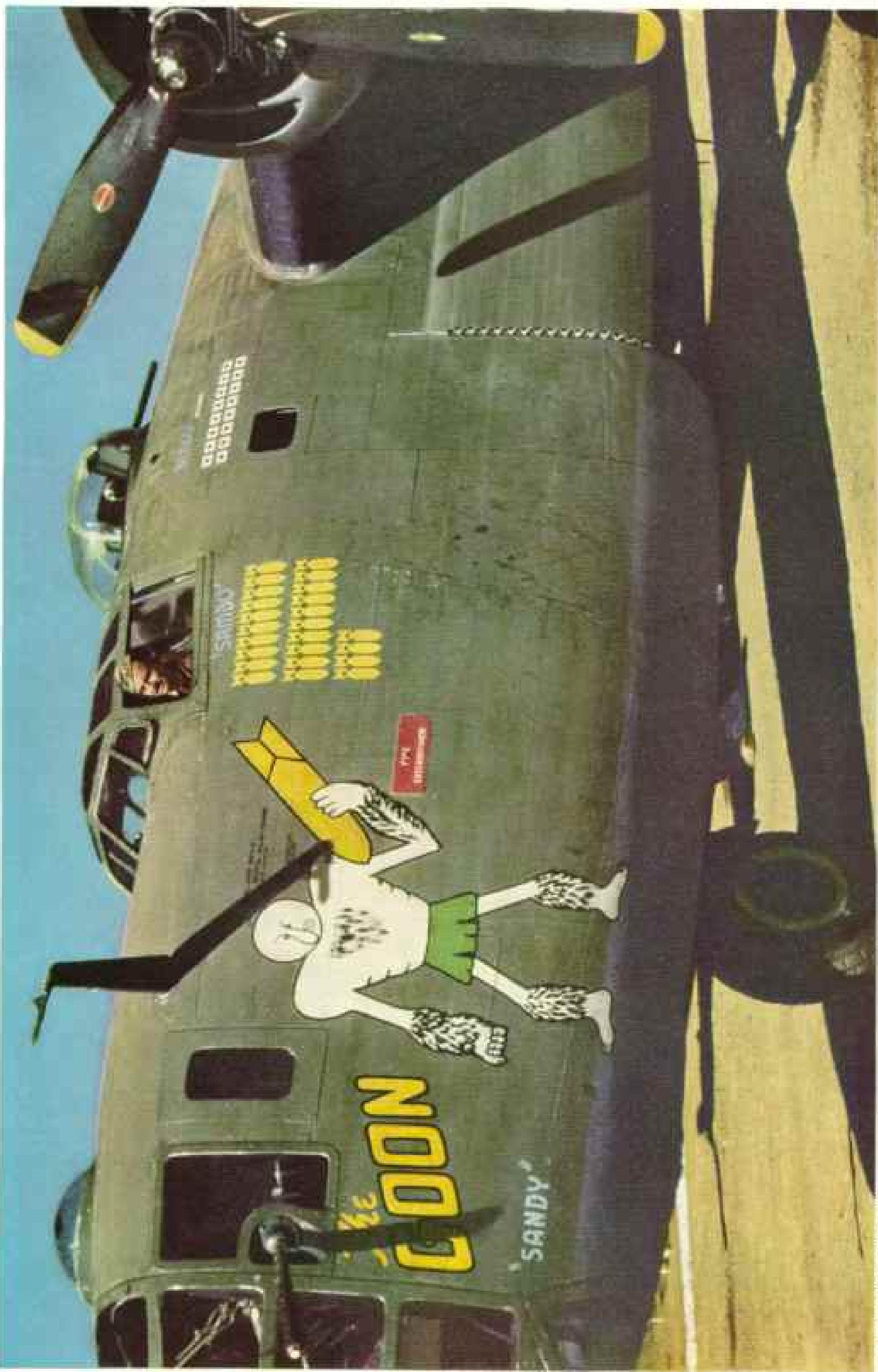


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Kalathur, India, U. S. Army Air Forces, Official

A Flying Tribute to Its Builders and Ground Crew Was "Nine O Nine"

This B-17 flew more than 100 missions. Its name came from the last three digits of its serial number. At an English base a ground-crew man adds another bomb to the rows signifying missions completed; others work on chin turret and engine. With peace, thousands of such craft became winged white elephants.



Kodakolor. U.S. Army Air Forces photo

If Jap Pilots Had Read American Comic Strips, They Might Have Given "The Coon" a Wide Berth
This hard-hitting B-24 Liberator wears symbols of 16 victories over Nipponese aircraft below its top turret. Under the pilot's window are home-signifying 24 missions.

© National Geographic Society



© Sumner's Photographic Studio
"Idiots' Delight" Passes Its 50-mission Milestone
The sergeant adds an extra-large bomb to this Flying Fortress' helmet-shield array, while the crew chief looks on. At top, two rows of swastikas testify that 14 German aircraft fell before the guns of "Idiots' Delight" in combat.



The Language of Scholars Provides a Bomber's Name
"Ave Maria," Latin for "Hail Mary," adorns the nose of a Twelfth Air Force B-17 Mitchell with 101 missions to its credit. The pretty signorina's picture is in keeping with the plane's field of operations—Italy.
© Sumner's Photographic Studio

The National Geographic Magazine



Airborne Pin-ups Helped the Navy Make Pick-ups at Sea

Nicknames of many bombers, like this Tinian-based PB4Y Privateer, came from popular songs. The Navy used Privateers for antisubmarine patrol, strikes against shipping, and air-sea rescue work.



© National Geographic Society

Photograph by R. Wallace Tait

"The Great Artiste" Dropped the Climactic Bomb of World War II

On August 9, 1945, this B-29 Superfortress dropped an atomic bomb which devastated Nagasaki, three days after a similar fate befell Hiroshima. On August 14, almost four years after Pearl Harbor, Japan surrendered.

Fun Helped Them Fight



© National Geographic Society

Kodachrome, U. S. Army Air Forces, Official

"Balls o' Fire" Fought from Tunisia to Italy

Historic targets of the Mediterranean campaign, beginning with Sfax and ending with Rome, are listed on this B-17 Mitchell's fuselage. Over the heads of the crew are painted bombs symbolizing 48 missions. The helmeted figure, with Hitler sprawling in his wake, resembles "Ole Bill," World War I cartoon character.

"Sweet and Lovely" Was Its Name—Deadly and Destructive Its Errand

Happiness at being back on the ground again, after a trip over enemy territory, is reflected in the faces of this B-17's crew. The "mustika" stands for an enemy plane downed; the bombs for routine missions; and the triangles for attacks on railroad-bomb launching sites on the French coast.





Bethlehem, U. S. Army Air Forces, Official

A Cloud-dwelling Angel Rides a Swift "Thunderbolt".
The mechanical adds a last touch before sending "Miss Behave" out on another mission. With "art" like this pilots strive to outdo each other in originality. The custom of nicknaming aircraft prevailed in all theaters of war.



National Archives—Courtesy

"Hookeem Cow" Wears Machine Guns for Horns
Twin .50-caliber weapons protrude from the nose turret of this B-17 Liberator, resting at its wartime base in England. Jutting from the fuselage behind the mechanic is the pilot's static tube connected with the air-speed indicator.



Map Making at 20,000 Feet Was "Picture Packing Mama's" Job

Instead of guns, this F-5, a modified P-38 Lightning, carried three cameras in its nose. By the trimetrogon process, they turned out overlapping photographs which became charts for the plotting of bomber missions.



© National Geographic Society

Koelschimer, U. S. Army Air Forces, Official

A Marauder Carried a Famous Railroad's Name into Battle

Many B-26s and other bombers were presented to the Air Forces by home groups such as the New York Central employers. Precision bombing was a specialty of the Marauder.

"Pyramids" of the New World

By NEIL MERTON JUDD

WHEN Antipater of Sidon compiled his list of the Seven Wonders of the World, he included the Pyramids of Giza but not those of Cholula and East St. Louis.

The Pyramid of Cholula, in the State of Puebla, Mexico, bulks larger than any other in the world. It covers three and one-half times the area of Cheops's famous monument at El Giza but is less than half as high.*

In the suburbs of East St. Louis, Illinois, Cahokia Mound likewise occupies more space than the largest Giza pyramid.

New World "pyramids," built by the ancestors of living American Indians, were constructed of earth or rubble faced with dressed stone or stucco. Where stone was lacking, as in the highlands of Mexico and the desert foothills of the Andes, mud bricks were commonly substituted.

But the fundamental difference between New and Old World pyramids is their function. Egyptian pyramids were tombs; those in the Americas, temple foundations. As such, the latter were necessarily truncated, or flat-topped. And those within the present United States were invariably accompanied by one or more conical burial mounds.

These burial mounds, as in the case of the Egyptian tombs, became an early attraction for treasure seekers.

In the New World, however, curiosity and scientific interest rather than cupidity spurred these men on. Otherwise, experience would soon have taught that Indian burials were accompanied not by gold and precious stones but only by earthenware vessels, shell beads, flint arrowheads and knives, and like objects of little monetary value.

Moreover, the Indians, unlike the Egyptians, had no elaborate method of preserving their dead. Among certain Indian tribes it was customary, by burial or otherwise, to remove the flesh from a corpse.

At prescribed intervals the principal bones from all such individual graves were gathered up for reinterment in a community pit, or ossuary. Thus an archeologist seeking to retrieve and interpret the unrecorded history of the "pyramid" builders finds the job difficult.

New World "pyramids" are found in a variety of forms from Peru to the Canadian border. They range in shape from the high, steep temple foundations of the Maya, through

* See "Daily Life in Ancient Egypt," by William C. Hayes, NATIONAL GEOGRAPHIC MAGAZINE, October, 1941.

the colossal pyramids of the Aztecs and their predecessors, to the huge, broad earthworks found in the United States.

North of Mexico these aboriginal pyramids are found chiefly in the wide valley of the Mississippi River and its tributaries.

"The Mound City"

St. Louis was once known as "the Mound City," from the number and character of its Indian remains. Most of them had already been obliterated, but 27 still remained at the north end of town in June, 1819, and were surveyed by members of Maj. Stephen H. Long's exploring expedition.

The task offered welcome respite from inactivity while they awaited repairs to their stern-wheeler, *Western Engineer*.

Gen. William H. Ashley, famed in the fur trade, built his palatial residence on a mound overlooking Broadway. Col. John O'Fallon, soldier, merchant, and philanthropist, selected another as the site of his mansion on lower Bellefontaine Road. The quantity of human bones unearthed during grading operations suggests O'Fallon's mound as an ossuary.

The "Big Mound," at the corner of Mound Street and Broadway, was best known. From it a street was named and the old Mound Market. For fifty years it had whetted the curiosity of passers-by (page 110).

When the mound finally was removed, in 1869, it was found to cover a burial chamber 8 feet high and more than 70 feet long. At least 20 bodies had been interred in the vault, but none survived the wreckers and souvenir collectors. All knowledge of the tombs' contents has been lost.

As St. Louis continued to expand and its Indian mounds vanished one by one, the advisability of preserving typical examples was advocated repeatedly. Finally, in 1870, the commissioners looked with favor upon a series of small mounds in Forest Park, "a few miles west of the city."

Of this series, the last two were razed preparatory to the Louisiana Purchase Exposition of 1904. Today a single mound stands within the borders of St. Louis, and that is in the southern part of the city overlooking the Mississippi.

Across the river and only six miles away are the remnants of the famous Cahokia Mound group. Here, in the heart of that extraordinarily rich agricultural area known as the "American Bottom," was an important Indian religious center.

In 1834 an Englishman, G. W. Featherstonhaugh, counted 60 mounds in a day's walk from St. Louis to Cahokia Creek and back again. He surmised that the larger elevations were refuges in time of flood.

Actually there were 67 major mounds in the assemblage and uncounted lesser ones. Most of these have since been razed or greatly reduced. The Powell Mound was steam-shovelled in 1931 to provide soil for a truck garden. When real estate goes up, Indian mounds come down!

Great Cahokia dominates the group. Its dimensions were recorded in 1882 as 998 feet north and south by 721 feet, by 99 feet high. Maximum height was reached in a succession of four unequal terraces (page 111).

A 16-acre Structure

Largest prehistoric earthwork in the United States, Great Cahokia occupies a little more than 16 acres. Its bulk has been estimated at about 21,690,000 cubic feet. Someone has calculated that, using only the simple tools available to its builders, construction of this single, loose-earth mound would have employed 1,000 Indians nearly five years.

Successive owners have contributed to the changing profile of Great Cahokia. In 1811 Trappist monks were growing vegetables on the lowest terrace; wheat on the upper two.

The whole top, about an acre and a half in area, was leveled off in 1830 or 1831 by a mechanic who liked the view and decided to build his home there. He constructed a wagon road up the west side and dug a well through the second terrace. A later owner drove a tunnel toward the heart of the mound just to see what was there.

Tunnel, well, and cellar walls showed *how* Cahokia was built, but not *why*. Its bulk consists principally of black humus, but here and there are conspicuous lenses of sand, tawny loess, or yellow clay.

As clearly, therefore, as if the construction had been recorded by motion pictures, we see men, women, and children at near-by pits filling baskets with rich bottom-land soil, clambering up to dump their individual loads on the growing pile, and returning for another basketful.

A few stragglers wander farther afield to sandbanks or wind-blown accumulations offering easier digging.

Omaha Indians have a tradition that their forefathers once lived where St. Louis now stands. Other Siouan-speaking peoples claim southern Ohio as their ancestral home.

Among archeologists, Ohio is celebrated for

the number and variety of its prehistoric earthworks. In 1848, in the first volume of the Smithsonian Contributions to Knowledge, E. G. Squier and E. H. Davis estimated 500 Indian mounds for Ross County alone; 10,000 for the entire State.*

Well-known Ohio cities occupy the sites of Indian villages. Marietta is one such; Cincinnati, another. Chillicothe stands in the middle of Ohio's Mound Builder area.†

On the northern edge of the city 23 restored tumuli are included in a park of 13 acres. The group at Marietta was surveyed by Gen. Rufus Putnam in 1788 and set aside by his fellow pioneers for preservation.

When whites first crossed the Allegheny Mountains to build new homes, the Mississippi Valley was occupied by diverse Indian tribes. Some hunted the buffalo, but others depended upon harvests from their fields. Some erected mounds; others did not.

Indian mounds, big and little, were everywhere. The latest Post Office Guide lists more than 30 cities and towns that take their names from Indian mounds in 17 States.

Moundsville, West Virginia, carefully guards its principal bond with the past. Here, as if a hub about which the city daily turns, is the famous Grave Creek Mound. It is a conical mound, largest of its kind in the United States, and formerly measured 320 feet in basal diameter by 70 feet high.

In 1838 its owner, unable longer to curb his curiosity, dug a shaft down through the center and tunneled in from the side. His reward was the finding of two log burial vaults, one on the base line and the second 30 feet above.

But Grave Creek Mound is remembered less for itself than for an inscribed pebble alleged to have been found during the 1838 excavations. Its inscription imitated that on Mr. Pickwick's celebrated discovery of a few weeks before: "Bil Stumps stone Oct 14 1838." Dickens' *Pickwick Papers* had at least one contemporary reader in Moundsville! —

On one of the three red hills at his home town in Tidewater Virginia, Powhatan erected a mat-covered temple for protection of his idols and the bones of his forefathers.

Thomas Jefferson Studied Mounds, Too

A few miles from Charlottesville Thomas Jefferson in 1780 excavated a mound 40 feet in diameter and 12 feet high. It covered the

* See "Ohio, the Gateway State," by Melville Chater, NATIONAL GEOGRAPHIC MAGAZINE, May, 1932.

† See "Indians of the Southeastern United States," by Matthew W. Stirling, NATIONAL GEOGRAPHIC MAGAZINE, January, 1946.



International

For President Truman the Pyramid of the Sun Was a Sermon in Stone

Visiting the famous Mexican site in March, 1947, the President said the world must have peace or our civilization may share the fate of those which Teotihuacan's vast pyramids represent. Gigantic Pyramids of Sun and Moon have amazed visitors since the days of Cortes (page 116). Viewed from Sun Pyramid's base, aboriginal religious processions mounting these west-side steps seemed to disappear into the sky.

bones of an estimated 1,000 secondary burials. Indians traveling the State road six miles away turned through the woods to pay brief tribute at this memorial to those who had gone before.

The first Protestant school in Georgia was built in 1736 on top of "Irene Mound," five miles from Savannah (page 115).

Where Pumpkinvine Creek joins the Etowah River a few miles south of Cartersville, in Bartow County, Georgia, three prominent mounds and several smaller ones mark the site of an important prehistoric Indian village. Its landward approach was protected by a moat 35 feet wide and 17 feet deep.

The largest of these mounds is a truncated pyramid now 61 feet high, covering about three acres. Annual plowing has destroyed

every vestige of the building that once stood on its flat top. Here, during their long war with the Creeks early in the 19th century, the Cherokees are said to have built a palisaded refuge for their women and children.

Both the Cherokees and the Creeks were mound builders, even within the historic period.

As described by James Adair, the British trader, Creek towns crowded about a central plaza where their most important ceremonies were performed and where Creek men played their famous game, *chunkey*.

The town house stood on a circular elevation at one end of the plaza; the temple, on a rectangular mound at the opposite end. A like arrangement obtained in Natchez towns of southwestern Mississippi.



Ms.Off from Atlanta Journal

Steel-reinforced Concrete Caps the Smoke Hole of a Ceremonial Earth Lodge in Georgia

Otherwise, this scientific restoration would make Mound Builder chiefs feel at home. Stocky supports stand in original postholes. Roof duplicates original oven to charred timber ends. This ceremonial and council chamber, 42 feet across, was underground except for roof covered by clay mound. Site is Ocmulgee National Monument.

The Natchez were sun worshipers; within their temples, walled and roofed with matting, a fire burned perpetually in honor of the sun. Each chief was known as the Great Sun, and the bones of deceased chiefs were carefully cleaned for preservation in the temple.

William Bartram, the American naturalist who traveled many Indian trading paths during the last half of the 18th century, tells us the Choctaws placed their dead on individual scaffolds 18 to 20 feet high.

After a time the bones were gathered up, cleaned, dried, and carefully laid in a special box in the "bone house." On a designated day each family carried its box to a predetermined place where all were piled and covered with earth. A feast followed this communal service.

The several Timucuan tribes of northern Florida heaped sand over their mass burials. One such mound, 16 feet high and at the southern end of Lake George, was named "Mount Royal."

When Hernando de Soto put his army ashore at Tampa Bay in May, 1539, he established headquarters in a little Timucuan village, home of Chief Ucita. The chief's house stood upon "a very high mount" near the beach; opposite, across an open square, "a wooden fowl with gilded eyes" stared at the strangers from the temple roof.

During his long, hazardous expedition through our southeastern states, De Soto passed many Indian settlements. Their inhabitants spoke six basically distinct languages. Local customs varied, too, even among related tribes. In Muskogean towns, elevating the chief's house and the temple



MEGII from Atlanta Journal

She Stoops to Enter Where Indian Women Weren't Allowed

This low, timber- and mat-lined entrance tunnel leads into the ceremonial earth lodge, Ocmulgee National Monument. Pattern of woven cane matting duplicates the original. Mound-building Macon Indians, perhaps as long ago as 600 years, held tribal powwows and religious ceremonies in the under-mound chamber (page 108).

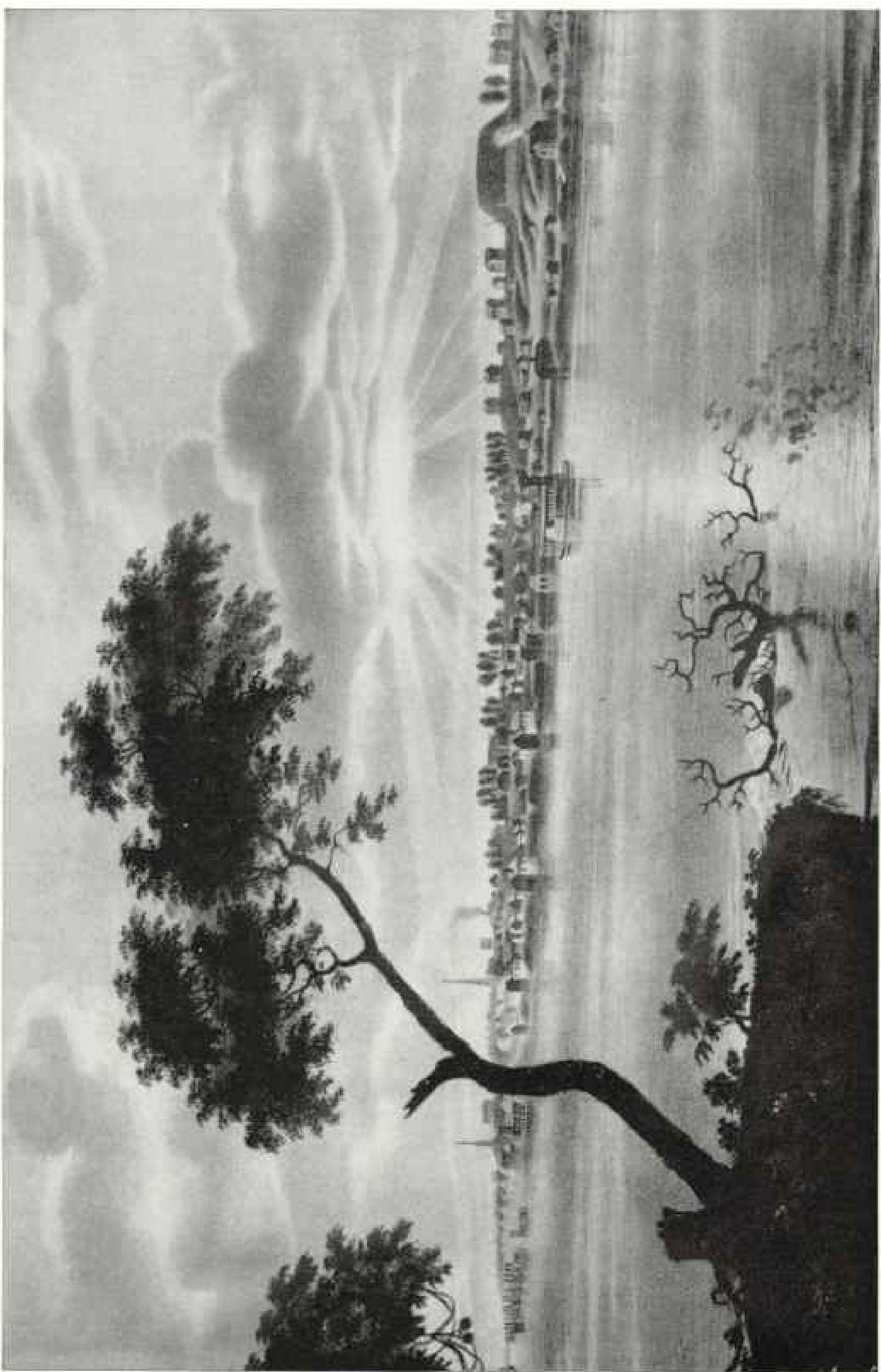
upon artificial platforms of earth was a recognized practice.

Living Memorials to the "Black Warrior"

Tuscaloosa, the Black Warrior, whose name is perpetuated by a city, county, and river in Alabama, sat unperturbed on the balcony of his house overlooking the village square in Atahachi, threw back his long feather cloak, and quietly signaled his fan bearer into action as he waited for De Soto and his captains, in heavy armor, to climb up to his level.

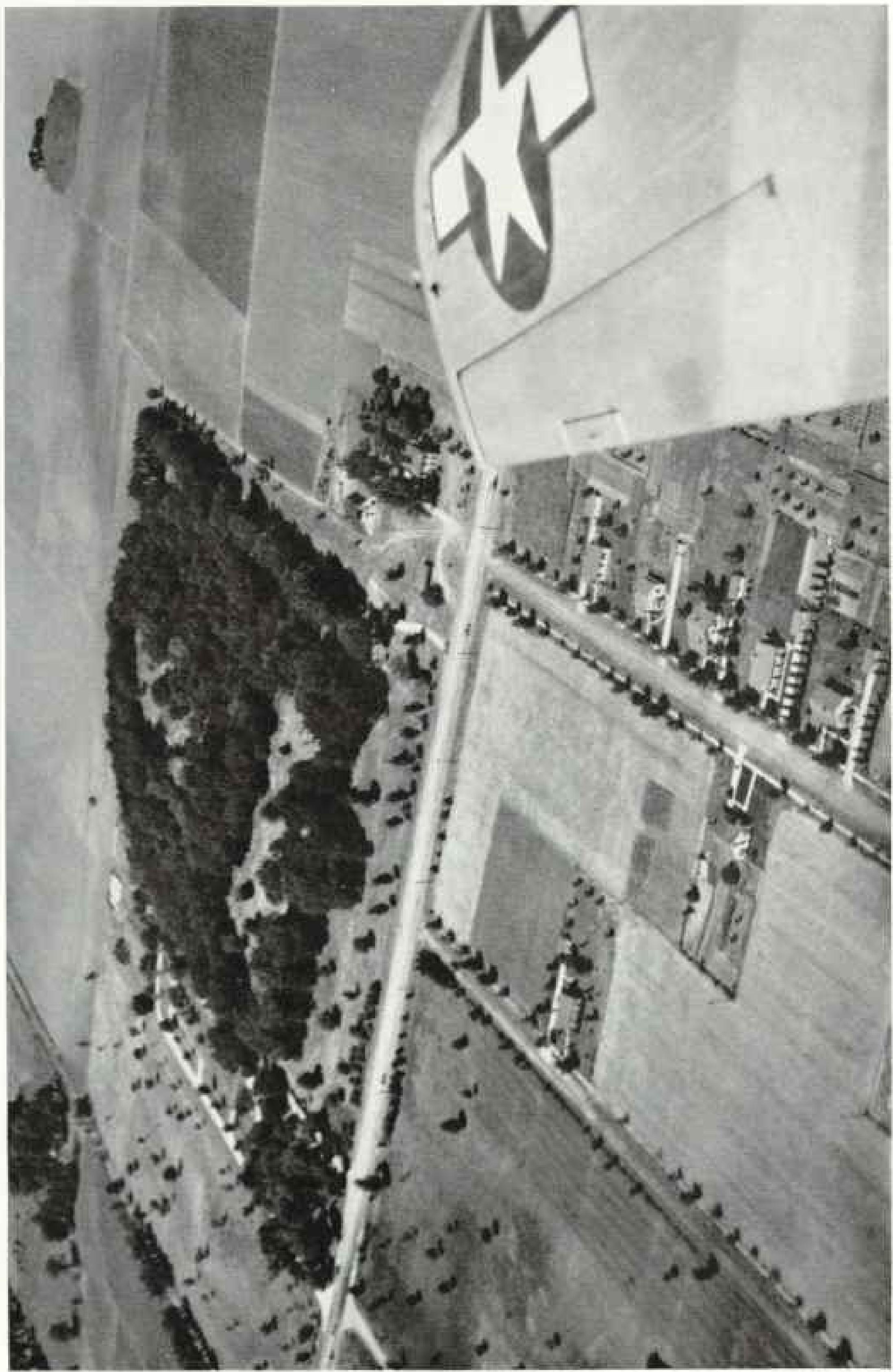
Thus from the Mississippi to the Atlantic and from the Great Lakes to the Gulf the same pattern obtained. Rounded or conical

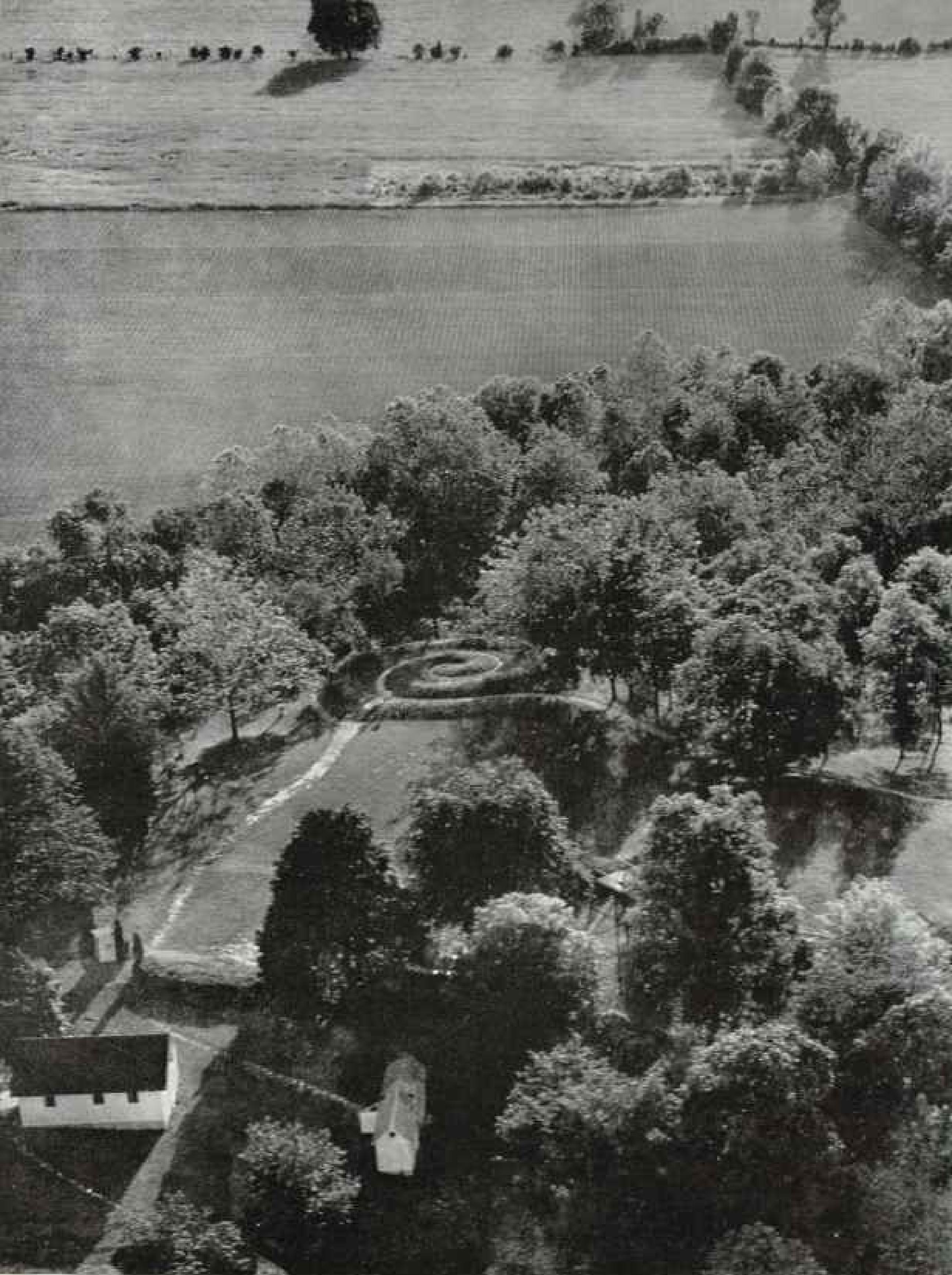
From David L. Whittle Jr.
Because of Its Many Indian Earthworks, Youthful St. Louis Was "Mound City" to Steamboaters on Of' Man River
Big Mound, shown here in an 1840 lithograph, was razed in 1869 as the city grew northward. It gave names to Mound Street and the old Mound Market. Twenty-seven sizable mounds remained in 1819, when members of Maj. Stephen Long's exploring party surveyed them while their boat underwent repairs (page 105).



Highest Prehistoric Earthwork in the United States Is the Cahokia Mound in Illinois

Some 350 years ago it was chief of an extensive mound group which, with St. Louis mounds across the Mississippi, formed a great religious center for mid-valley Indians. Scientists estimate building its huge bulk took the equivalent of 1,000 Indians working five years.





Ohio's "Great Serpent" Glides Its Sinuous Way Through a Smiling Countryside

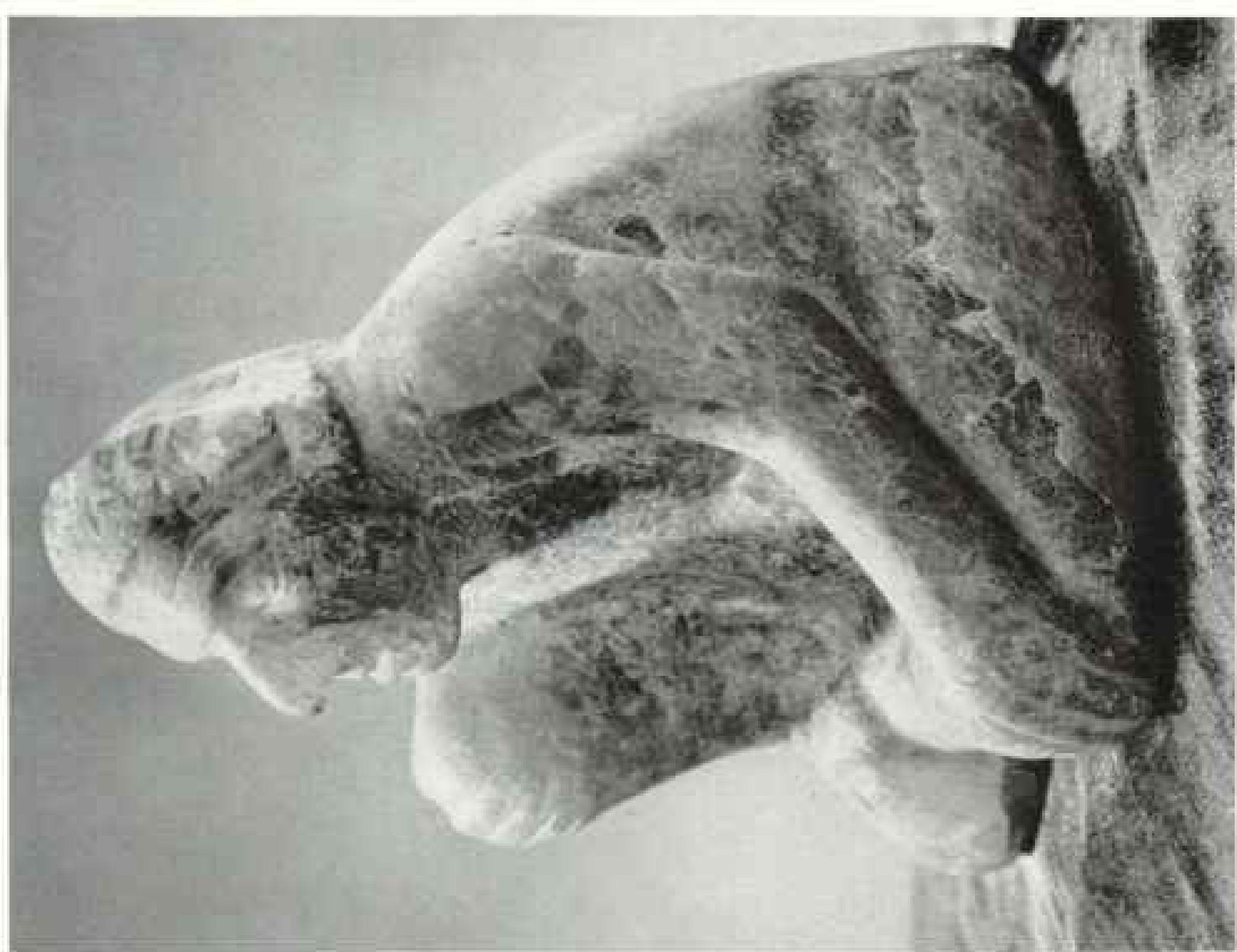
Probably for religious reasons, some mound-building Indians constructed mounds in the likeness of animals, birds, or even humans. They abound in the upper Mississippi and Great Lakes area. This unusual serpent is 1,330 feet long, 20 feet wide, and from 2 to 3½ feet high. The site is now a State park.



Lt. Col. Albert W. Stevens, Ret.

It Is America's Largest and Most Remarkable Effigy Mound

The tail, at left, is coiled, and the body makes three graceful loops. Scientists disagree about its head. Some see the snake's extended jaws about to seize an egg. Others say the body once continued along the ridge to Ohio Brush Creek (now tree-lined), and the oval is aboriginal method of portraying the snake's heart.



From an Indian Mound Came This Aboriginal "Thinker"

Carved from yellow fluorite, the 9-inch figurine is a masterpiece of primitive sculpture. Experts consider it one of the rarest specimens of Indian art to come from eastern North America. Unusual realism shows in features, headdress, and flattened rear of skull.



No Mean Engineering Feat Was This Colossal Toltec Goddess

Its pre-Aztec creators quarried, carved, and erected it without metal tools, beasts of burden, or use of the wheel. About 10½ feet high, the goddess tips the scales at nearly 25 tons. Now in Mexico City's National Museum, it stood near the Pyramid of the Moon at Teotihuacn (page 116).

Prehistoric Postholes Blueprint Summit Buildings and Palisades atop Georgia's Irene Mound

Horn excavation has reached the fifth of eight superimposed mounds which formed the final hill. Fire basin and wall foundation of summit building of mound 6 remain (B). Mound 6 also had second daub and white building area (A), and molds left by log steps (D) are from mound 5. Fill used to build much higher mounds 7 and 8 shows at left (G). County engineers who needed dirt removed rear of mound in 1911.



mounds, by far the more numerous, were burial places; quadrangular, flat-topped mounds were artificial hills supporting temples or chieftains' dwellings.

A French engineer, Alexander De Batz, visited and sketched the last temple of the Acolapissa, 40 miles north of New Orleans, April 15, 1732, two months after George Washington was born.

What may have been the last great communal reburial service in the Mississippi Valley was held near the present Spiro, Oklahoma, a few generations before Columbus set sail for the New World. To mark the site, a large conical mound and three lesser ones were erected.

In 1933 these mounds were pillaged and their contents scattered. Thus, before qualified observers could come to the rescue, the opportunity to study aboriginal materials of incomparable historical interest had been lost.

The main Spiro mound was built as a sepulcher. It was constructed in three stages and was in reality three separate burial mounds one on top the other. Together, they contained approximately 2,500 skeletons.

The central vault was hung with fabrics made of vegetable fibers, or a combination of fiber and feathers, and of rabbit fur mixed with buffalo hair. Pearl beads were measured by the quart; shell beads, by the peck.

There were implements and ornaments of copper mined near Lake Superior; carved *Buoycon* shells from the Gulf of Mexico. Elaborately costumed figures on some of these shells suggest art influences from Mexico or Central America.

Archeologists still debate the question of cultural borrowing in pre-Spanish times between Indian tribes of our southern States and those dwelling south of the Rio Grande.

No one knows when the Valley of Mexico was first settled or by whom. Its legendary history goes back only to A. D. 500 or 600 and the founding city of Teotihuacán. Yet, at the opposite end of the Valley, south of Mexico City, a blanket of lava 12 to 25 feet thick covers the bones and broken utensils of an older people.

HIGHLAND MEXICO'S OLDEST RELIGIOUS EDIFICE

These nameless older folk built the Pyramid of Cuiculco, oldest known religious edifice in highland Mexico.* A truncated cone made of clay veneered with basalt blocks, it originally was about 370 feet in diameter and 60 feet high. Four successive enlargements, each enveloping its predecessor, attest the length of time the structure served its congregation.

An open-air clay altar stood on top the

Cuiculco pyramid. Not until the fourth remodeling was the altar roofed over. Post-holes in the fifth and final floor evidence a stationary covering, foreshadowing the walled temple to follow.

Teotihuacán, "Home of the Gods," lies 25 miles northeast of Mexico City. It was the principal religious center of the Toltecs until their highland empire fell to the Aztecs about A. D. 1200. Stratigraphic tests in old refuse piles revealed potsherds in the lower levels that archeologists date as early as A. D. 300.†

In the heyday of Teotihuacán its temples, shrines, and priestly palaces extended over an estimated seven square miles. Dominating this vast assemblage were the so-called "pyramids" of the Sun and Moon (pages 107 and 118).

The latter, in ruins, still stands 140 feet high. At its foot is an open square or plaza, northern termination of the mile-long "Pathway of the Dead."

Sun Pyramid stands east of the Pathway and occupies an area of nearly 11 acres. No two sides are of equal length, but they average close to 692 feet.

The Sun Pyramid was built of adobe bricks overlaid with stone and plastered. Its bulk has been calculated at 35,067,596 cubic feet. Exploratory tunnels reveal that the original construction was enlarged three different times by laying a new veneer upon the old. The outermost coating, broken and weathered through long exposure, was removed during restoration in 1905-1910. Thus the basal dimensions given above are probably 25 or 30 feet less than they were at the time of the Spanish Conquest.

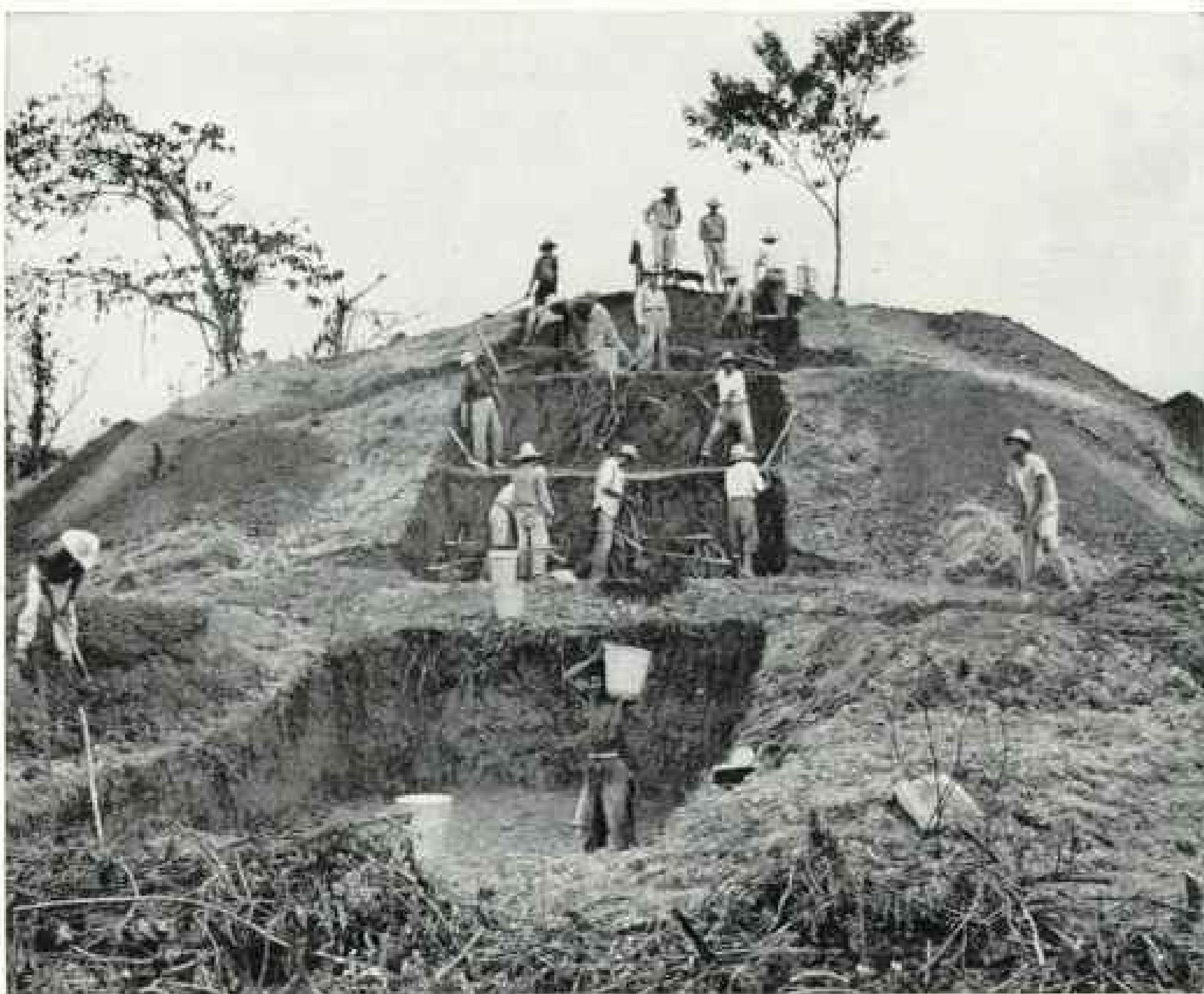
To stand at the foot of Sun Pyramid and gaze up at its peak is an awesome experience. Its immensity is overwhelming. Its four triangular sides swim up and away to merge and melt at infinity. They create the illusion of perfectly plain surfaces, but in reality are broken by four terraces.

The uppermost level, on which the Sun Temple stood, lies 212 feet above the basal platform. Its area is over 5,000 square feet. But of the temple itself nothing now remains except the earthen floor. Its walls may have been of stone or wood; its roof, of thatch.

Although of light construction and impermanent, the temple sheltered one of the most important idols at Teotihuacán. It was of stone, 6 feet wide by 6 feet thick, and 18 feet

* See "Ruins of Cuiculco May Revolutionize Our History of Ancient America," by Byron Cummings, NATIONAL GEOGRAPHIC MAGAZINE, August, 1921.

† See "Interesting Visit to the Ancient Pyramids of San Juan Teotihuacan," by A. C. Galloway, NATIONAL GEOGRAPHIC MAGAZINE, December, 1910.



Staff Photographer Richard E. Stewart

Olmec Mounds of Southern Mexico Were Forerunners of Maya and Aztec Pyramids

Olmec, or La Venta, people inhabited the tropical lowlands of Veracruz and Tabasco. They produced one of the earliest high cultures of Middle America, which reached its peak in the sixth century A. D. Eight National Geographic Society-Smithsonian Institution archeological expeditions, led by Dr. Matthew W. Stirling, have probed the mysteries of La Venta man. Here workers of the 1946 expedition cross-section a temple mound in San Lorenzo.

high. It represented the sun and, according to local Indians 50 years after the Conquest, was called Tonacatecuhtli, "the Giver of Life."

The statue faced west, overlooking the ceremonial stairway. An individual standing at the foot of that stairway cannot see the uppermost step. This may, or may not, be a conscious architectural achievement of the builders.

Costumes Lavish and Luxurious

One must retreat a short distance to visualize the scenes once recurrent here—Indians crowding vantage points overlooking the Pathway of the Dead; marching men chanting as they march, blowing on shell trumpets and clay flutes; pennants fluttering from the terraces above; and pungent smoke rolling down from incense pots and braziers.

The baleful notes of a great wooden drum

echo out across the valley as priests in sinister black receive the captive and rush him up the steep steps to the sacrificial block.

Aztec codices and wall paintings illustrate the lavish costumes of priests and rulers on important occasions—richly ornamented cotton fabrics and high-booted sandals; capes and headdresses bright with the plumage of tropical birds; jade nose plugs and earrings; necklaces and bracelets of semiprecious stones.

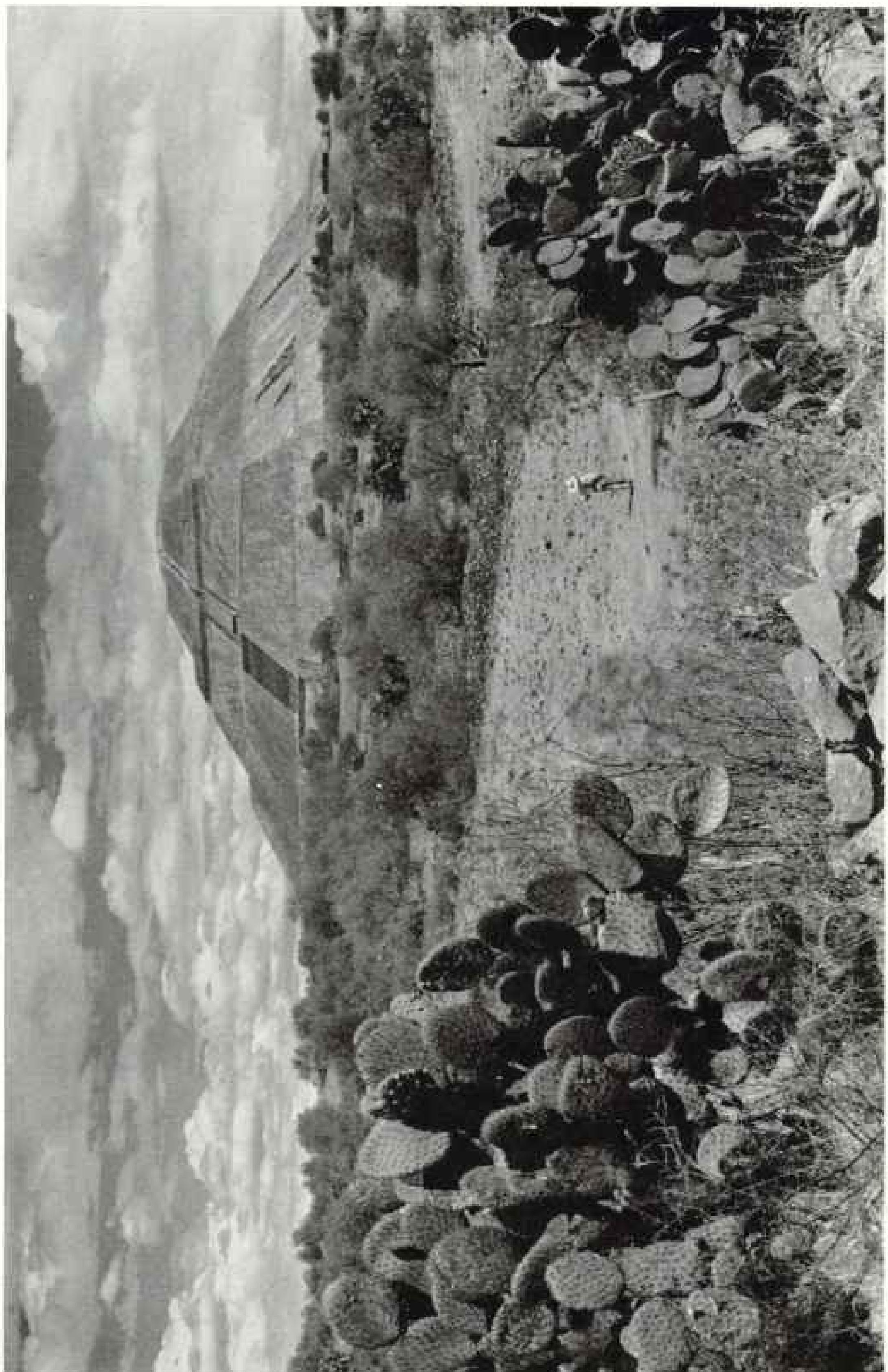
Nowhere in the world, not even in ancient Assyria and Egypt, were religious observances more colorful, more spectacular, than those of Mexico in pre-Spanish times.

Eighteen major celebrations were held annually at Teotihuacan, one at the end of each 20-day month. The great Montezuma is said to have attended these fiestas, borne out from his island city and back in a gilded litter on the shoulders of his nobles.

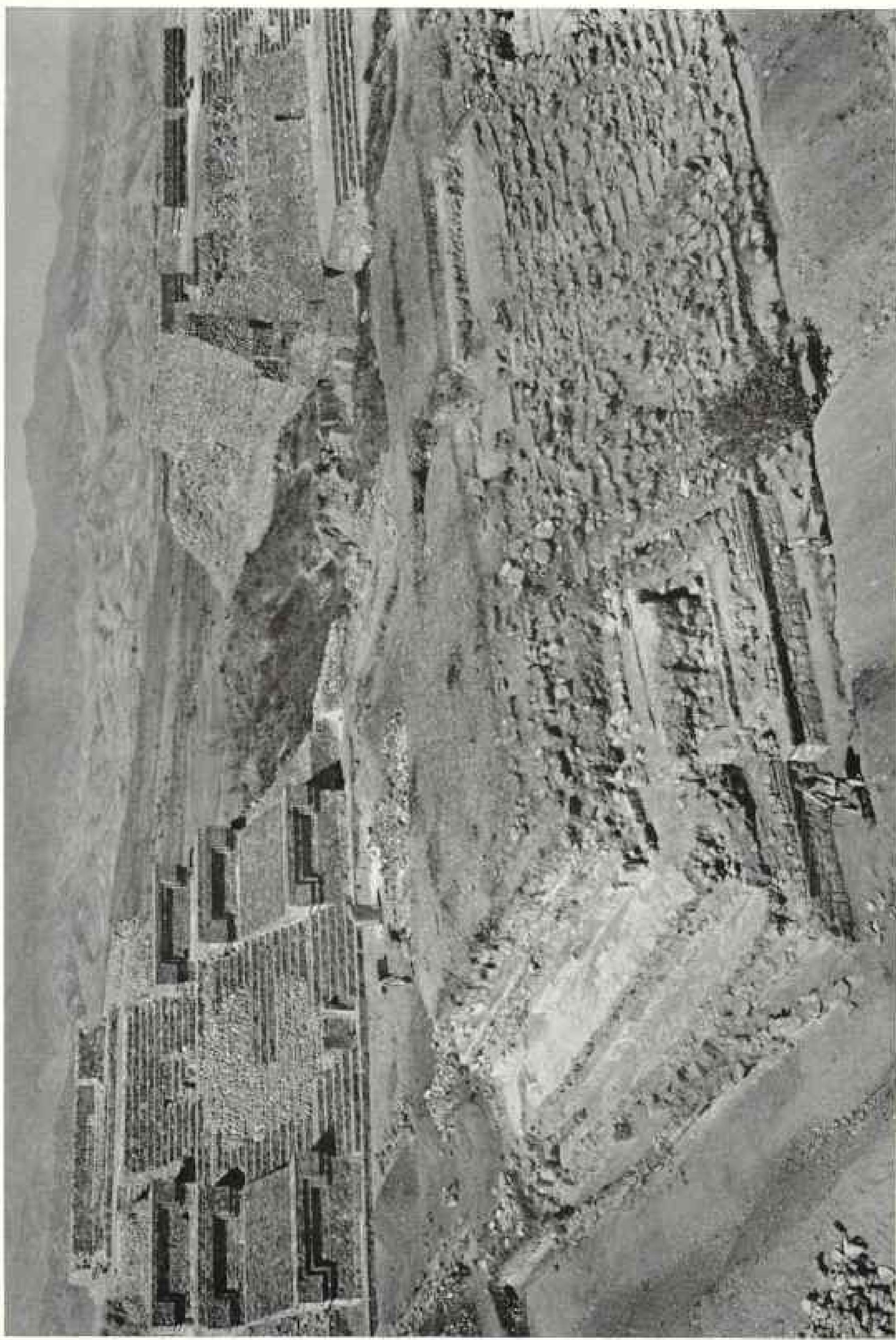
Photo Illustration by Leslie Mierahn

Rising from a Semiarid Plain, Mexico's Mysterious Pyramid of the Sun Is a Vast Monument to Lost Civilizations

An unknown people began its huge mass early in the Christian Era. Enlarged by Toltecs and Aztecs, it remained for centuries the chief feature of Teotihuacán, important religious center of both peoples. Its summit temple stood more than 200 feet above the priestly city and some 50 feet above the near-by Moon Pyramid.



Crumbling Pyramids on a Terraced Mountain Mark the Rich Site of Monte Albán, Mexico, Now Being Restored



Teotihuacán survived collapse of the Toltec empire in the 13th century. It was partially rebuilt by the Aztecs and remained an important place of worship. All this is illustrated by new edifices and changes in architecture.

Thus the spade of the archeologist confirms the testimony of resident Indians as recorded by Francisco de Castañeda in 1580.

These same natives also testified that their people were healthier in pre-Spanish times and lived longer because they wore less clothing, married later in life, and ate nothing but tortillas, chili, and beans. When they were boys, so the old men affirmed, only priests and members of the ruling class were privileged to eat wild turkeys, deer, and other game.

At Tenochtitlán, predecessor of modern Mexico City, pyramids and their surmounting temples likewise were prominent features of every view. Towering above the massed green of distant trees, these white *cues* were first to attract the attention of Cortés and his men as they advanced along the causeway from Ixtapalapa, November 8, 1519.

"It was like the enchantments they tell of in the legend of Amadis," wrote Bernal Díaz del Castillo, one of Cortés' most dependable swordsmen.

The worldly Spaniards were amazed at this Indian city-in-a-lake. Its population at the time has been estimated at 300,000. Its houses, built of stone or adobe and plastered over, were predominantly white, although here and there was one constructed of *tezontli*, a pink to purplish-red volcanic ash.

Life in the "Island City"

Life within this island city revolved about a religio-political zone. Here was the Great Pyramid jointly honoring Tlaloc, the Rain God, and Huitzilopochtli, God of War. Here, too, were the Gladiatorial Stone, the Skull Rack, and diverse other structures connected with Aztec religion.*

Completion of this pyramid about A. D. 1490 and dedication of its dual temple was deemed an occasion calling for the sacrifice of no fewer than 20,000 war captives. They had been taken in Oaxaca during a two-year campaign waged for that purpose.

Part of the ceremonial stairway up which those and other thousands were dragged to the sacrificial block may be seen today at the corner of Guatemala and Argentina Streets, only a block from the Cathedral (page 121).

Fray Bernardino de Sahagún, 16th-century authority on the Aztec language and religion, lists 77 lesser pyramid-temples and other buildings in the area immediately surrounding the Great Pyramid.

A mile north of this focal point in Tenochtitlán was the religious center of Tlaltelolco, another island settlement that had its origin in three or four rectangular gardens floating among the reeds.

Huitzilopochtli, the War God, and Tezcatlipoca of the Smoking Mirror, God of Earth and Sky, occupied the chief temple at Tlaltelolco. This stood on a high pyramid dominating the whole public area, an area so spacious it seemed to Bernal Díaz "larger than the plaza of Salamanca."

Four days after Cortés made his entrance into Tenochtitlán he expressed a desire to visit the temple atop the great pyramid of Tlaltelolco. Montezuma insisted upon preceding him and hastily made another sacrifice to appease his gods for the stranger's effrontery.

The Burning of the Human Hearts

When old Bernal Díaz wrote his *True History* long after the Conquest, recollections of that first visit to the Tlaltelolco pyramid were still vivid. He remembered the 114 broad steep steps, the double temple at the top, and the two arched stones on which slaves and war captives were sacrificed.

He remembered the two monstrous stone idols and their terrible eyes, their coatings of gold and pearls, their necklaces representing human heads and hearts. He remembered the wooden roof comb of the temple with its ornamental carving, and the small niche wherein sat the God of Planting Time, said to contain seeds of all the plants that grew in Aztec land.

Most indelible of all, however, was memory of the eight human hearts burning before the two idols, the blood freshly splashed all about, and a stench that reminded the grim warrior of rural slaughterhouses in Spain.

Aztec pyramids were of solid masonry. They contained no interior chamber. Usually they were built of irregular blocks of stone laid in plaster. Older examples were coated with stucco; later ones, with dressed limestone.

Among all the Aztec temples in use at the time of the Spanish Conquest none is more representative than that of Tenayuca, six miles north of Mexico City.

Tenayuca was known to the Spaniards as "the Place of the Serpents." Carved rattlesnakes were everywhere, inside and out. Two huge stone serpents occupied the principal altar; 156 lesser carvings rested on a narrow walk around the temple platform; snake heads protruded from walls and stairways (pages 126 and 128).

* See "In the Empire of the Aztecs," by Frank H. H. Roberts, Jr., NATIONAL GEOGRAPHIC MAGAZINE, June, 1917.



Hondrich: Hedges from Times Lima

Ruins of an Aztec Temple Pyramid Underlie Mexico City's Main Plaza

Center of Montezuma's capital was the Gran Teocalli, a steep-sided pyramid supporting temples to the gods of war and rain. Zealous Spaniards razed the structure, built on its site the chief square and public buildings of their new capital. Aztec ruins also underlie the Cathedral, in background. This corner of the pyramid, where two busy streets meet, is now a public monument.

Altogether, there were at least 800 representations of serpents in and about this place of worship. According to the Mexican archeologists who excavated and restored it, this Snake Temple was rebuilt five or six times.

Life Begins Anew—at 52 Years

Periodic temple reconstruction was one means of attaining the ceremonial purity required by the religion of Nahuatl peoples. On the first day of each year temple furnishings were renewed, dwellings were swept with unusual care, and all kitchen utensils were broken and discarded.

Every 52 years brought a major renewal rite, a spiritual and material rebirth. The old was cast off, and life began anew. Even personal clothing and household furniture were replaced. Temples no less than houses were rebuilt. After burning 52 years the altar fire was extinguished and a new one kindled. From this new fire live coals were hurried to relight the hearth in every home.

The last New Fire Ceremony was held at Tenayuca in 1507, thirteen years before the Spanish Conquest. When that cycle finally came to an end and a new one was beginning in 1559, all the Indian temples in Mexico



had been wrecked and their idols overturned.

Few, if any, religious cities in upland Mexico were more renowned than Cholula. Its patron deity was Quetzalcoatl, the Feathered Serpent, God of Learning and Bringer of Civilization.

Cholula was a holy place, a Mecca, even in early times. Its unknown founders created a religious center by grouping their shrines and altars. Subsequently, this center was half buried beneath a new agglomeration of shrines, altar platforms, and associated structures when Toltec peoples invaded the valley sometime in the sixth or seventh century.

Thereafter, for 400 or 500 years, reconstruction and substitution were recurrent; complete replacement accompanied the New Fire Ceremony every 52 years. Eventually these rebuilding activities filled and overflowed the earlier Toltec temples and courtyards, concealing the whole assemblage under a single colossal pyramid of adobe bricks.

The vastness of this pile is simply incredible. It sprawls over 45 acres, three-and-a-half times the basal area of the largest Egyptian pyramid. Its slopes are so irregular with terraces, offsets, and abutments one can scarcely picture it as it used to be.

The walled churchyard now at its top is 178 feet above the plain. An additional 15 to 20 feet were torn off the apex when a Christian

church first replaced the Temple of Quetzalcoatl (page 124).

Mexican archeologists have devoted years to the study of this gigantic man-made mountain. Their exploratory tunnels extend more than a mile through its interior, tracing successive types of construction and changing profiles.

During post-Conquest years schools for the instruction of Indian boys were established here, as elsewhere throughout Mexico.

Cholula Reflects Glories of Past

In these schools friars often drew upon local history to point up worldly lessons. Ever since then Mexican legend has credited Cholula Pyramid, rather than the Tower of Babel, as the place where tongues were confused.

The present-day village of Cholula modestly reflects the grandeur of its past. Amid green and brown fields, white-walled churches stand each upon the former site of an Indian temple.

Here, you are told, one may attend a different church every day of the year. The accepted favorite is that of Nuestra Señora de los Remedios, atop the great pyramid. As was its pagan predecessor, the church is annually the goal of pilgrims from all over upland Mexico.

Actually, of course, the mountain of mud bricks at Cholula is not a true pyramid and never was. A pyramid is a solid designed



Pyramid-building Maya Carved Aboriginal America's Art Masterpiece

While Europe languished in the Dark Ages following the Roman Empire's collapse, art in unknown America reached a climax in the work of Maya stone carvers. Finest known specimen of their skill is a lintel which decorated a pyramid temple in ancient Piedras Negras, Guatemala.

The lintel, appearing at left in a meticulous restoration, shows priest or chief holding audience with lesser dignitaries. The perfectly proportioned figures suggest actual portraiture. Their natural poses are reminiscent of Greek art. Unusual realism and amazing detail, both evident in the original, compare favorably with similar work of any peoples.

In this lintel the sculptor combined low and high relief with sculpture in the round, creating one of the few known Maya examples of such skill. The chief's extended arm and the heads of squatting nobles were carved in the round.

Some 158 hieroglyphs form the border. Experts deciphered six dates and concluded that this greatest known pre-Columbian work of art had been executed A. D. 761.

The Piedras Negras site was discovered in 1895 and excavated extensively in the 1930's. J. Alden Mason, discoverer of the lintel, described his experiences there in the November, 1935, issue of the *NATIONAL GEOGRAPHIC MAGAZINE*.

From University Museum, Philadelphia.

as an individual tomb and having triangular sides meeting in a common vertex. Nowhere in the Americas do we find an aboriginal construction that precisely meets this definition. Many, however, closely approximate it, as for example the Hill of the Sun at Teotihuacán.

A second structure closely resembling a true pyramid is El Castillo at Chichén Itzá, a ruined Maya city in northern Yucatán.

The Castle's pyramidal foundation is 197 feet square at the base and 79 feet high. Its slopes rise in nine terraces and at an angle of 50 degrees. As a concession to art rather than necessity, each side has a stairway.

The risers averaged about 11 inches, or half again the height of steps in North American homes. The north stairway was the most important, since the temple faced that way. Giant serpent heads terminated its balustrades.

A Venerable Maya City

Bernal Diaz del Castillo was a soldier, the only soldier in Cortés's army with a childish whim for counting steps. The Aztec pyramid at Texcoco had 117. The great Chohula Pyramid, with 120, was highest of all. The temple on the chief pyramid at Tlaltelolco, most insatiably bloodthirsty of its time, was reached by 114 steps. Diaz counted them while Montezuma sacrificed a couple of captives at the top.

The venerable Maya city of Copán, in western Honduras, is several centuries older than Chichén Itzá. Its ruins spread over some 12 square miles; the main group of plazas, platforms, and sacred buildings alone covers over 60 acres. Platforms rise irregularly above courtyards, and pyramids rise above platforms.

The religious architecture of the Maya developed independently from that of the Toltecs; yet both featured temples and palaces. For both, the external aspect received most attention. It was the outward effect that was desired.

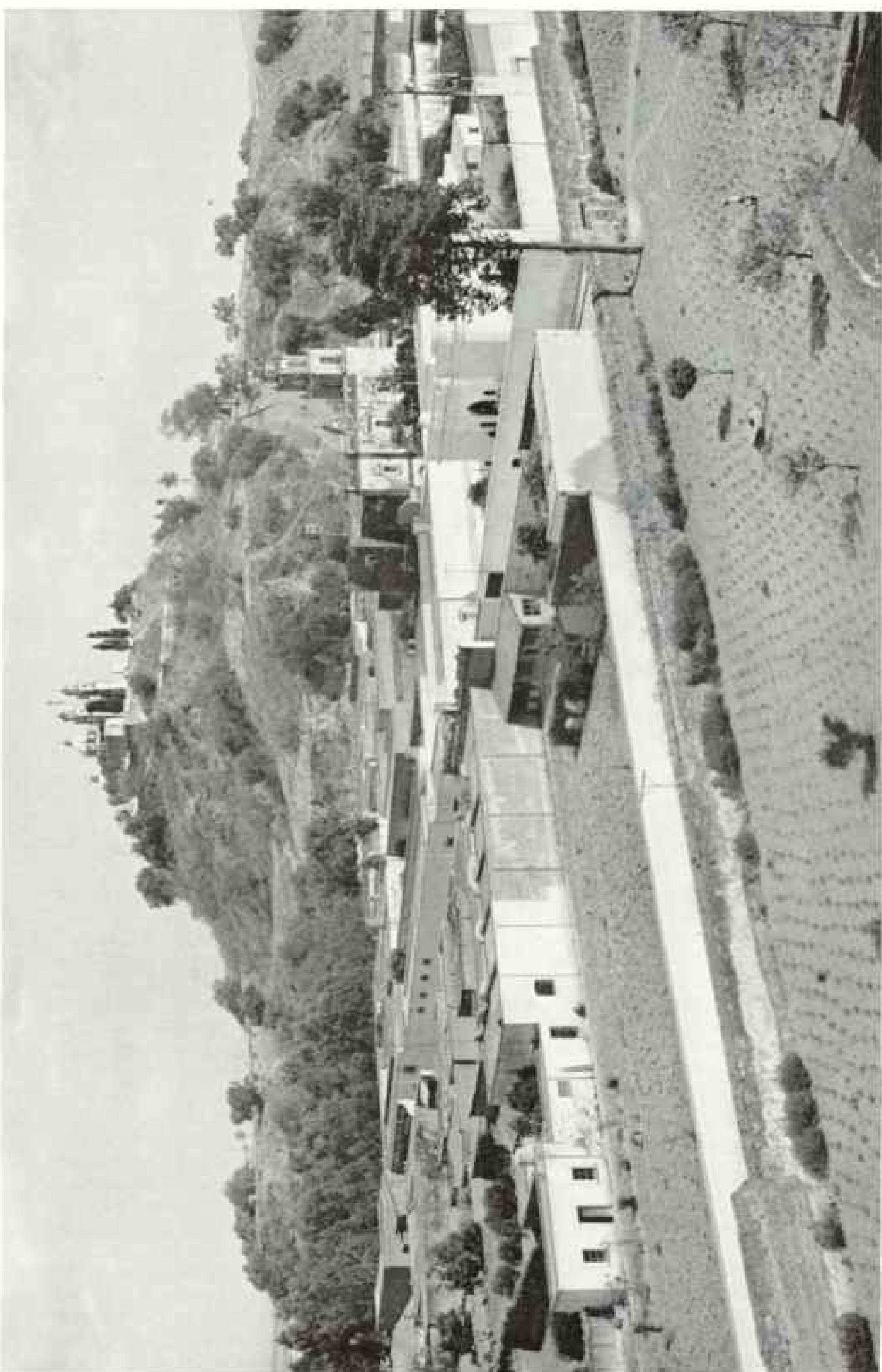
So-called "palaces," the presumed residences of priests and other officials, were multiple-roomed structures generally on low, stepped platforms. Sometimes two and even three stories were present. Lesser citizens dwelt in one-room huts, thatched with palm leaves.

Temples, on the other hand, were never more than one story. They were composed of three essentially independent elements: the substructure, the sanctuary and its antechamber, if any, and the superstructure.

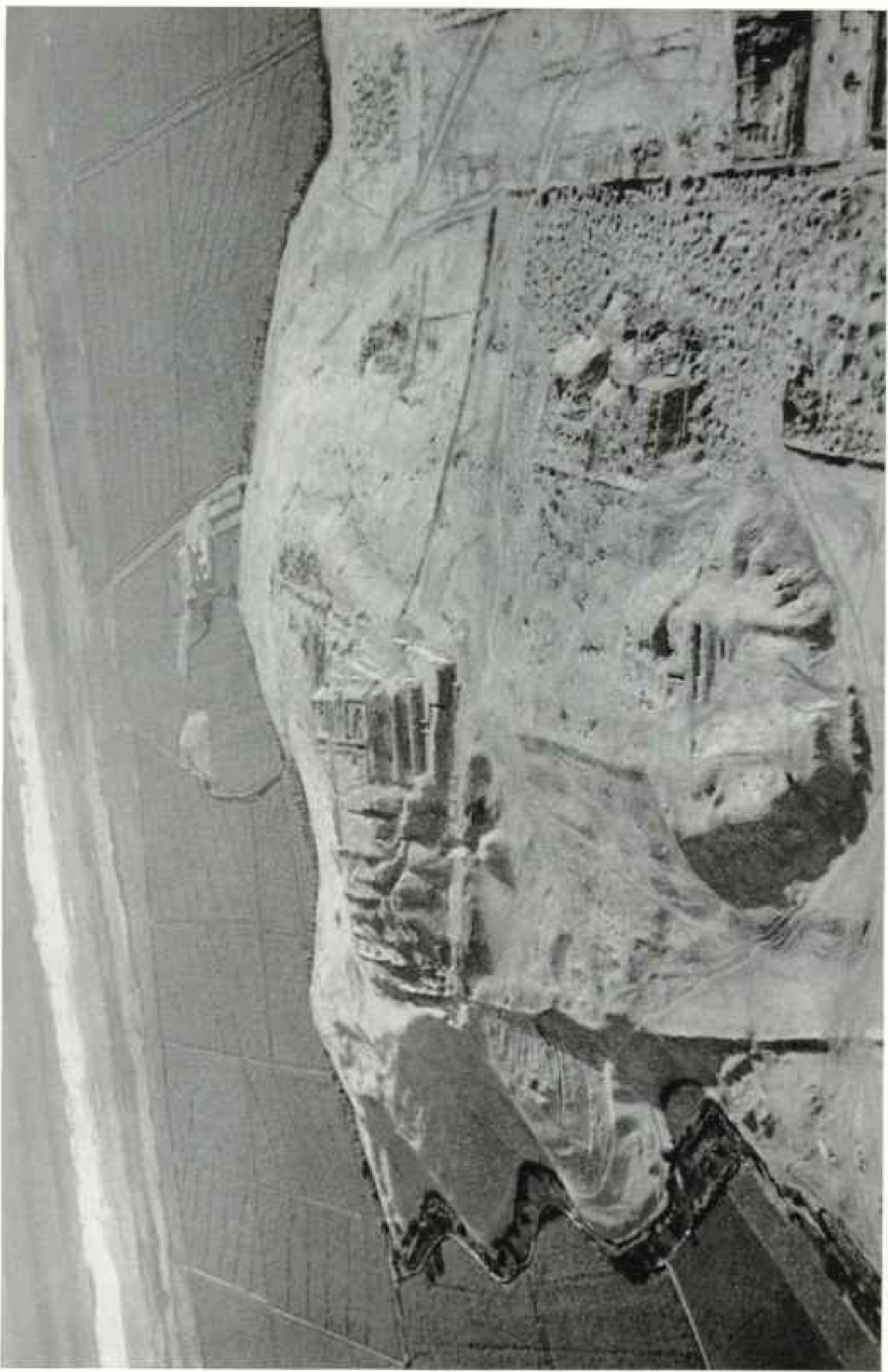
The only conceivable purpose of the superstructure was ornamental. Commonly latticed to reduce weight, it was designed to be viewed solely from the front. Thus the superstructure of Maya temples provided balance and the illusion of spaciousness within, like the

Christian Church Replaced Pyramid Temple atop the Pyramid of Cholula, Largest of Its Kind in the World

Like its predecessor, the church is a goal for pilgrims from all over Mexico. The colossal pyramid, now time-disguised, expected an imposing temple to the god Quetzalcoatl. Invading Spaniards destroyed it and pillaged the flourishing town. Archaeologists have tunneled wholly through pyramid's whole interior (page 122).



Conquering Incus Built a Terraced Temple of the Sun to Outshine Pachacamac, Creator-God of Coastal Indians
Its vast, adobe-brick ruins crown a barren hill overlooking the Pacific some 20 miles south of Lima. Once Mœn of the Inca empire, it is today one of Peru's most important archeological sites. Except for Middle America, New World "pyramid" construction reached its greatest perfection along this coast (page 127).



Dwarf Fish Beach near



Kurt Sevcik from Three Lions

Mexican Girls Dance Where Aztec Priests Performed Celestial Rites

Tenayuca's temple pyramid was dedicated to observation and worship of the Sun (page 120). Two coiled, crested snakes on opposite sides of the pyramid were Dragons of Fire. They pointed to the Solstices and showed the deity his heavenly course. Platform is an altar, which may have symbolized the Earth, into which Aztecs believed the Sun fell nightly to illuminate the world of the dead.

false fronts on modern Main Street stores.

The roof crest on the Temple of the Cross at Palenque gave the building an over-all height of about 42 feet, just a little more than the height of the truncated platform on which the temple stood.

Including base and superstructure, several temples at the old Maya city of Tikal, in northern Guatemala, attained a height of 170 feet or more. The highest stands 229 feet and was built in the fourth century. Tikal pyramids are reported the highest and steepest in all Yucatán.*

The Mayans Were Fine Sculptors

Mayan art likewise was essentially a religious expression. To judge from their bearing and elaborate dress, priests and rulers were often pictured, as were visiting dignitaries and prisoners of war.

In ability to portray the human body in profile, Maya sculptors far excelled those

of ancient Egypt and the Near East. The court scene on a temple lintel from Piedras Negras, Guatemala, is one of the finest examples of aboriginal art ever produced (pages 122-123).†

Chichen Itzá, abandoned A. D. 692, was re-established in 928.‡ It experienced a phenomenal rebirth and development during the next 200 years. Then war with neighboring Mayapán broke out in 1194. With the

* See "Yucatán, Home of the Gifted Maya," by Sylvanus Griswold Morley, NATIONAL GEOGRAPHIC MAGAZINE, November, 1936.

† See "Preserving Ancient America's Finest Sculptures," by J. Alden Mason, NATIONAL GEOGRAPHIC MAGAZINE, November, 1935.

‡ See, in the NATIONAL GEOGRAPHIC MAGAZINE, by Sylvanus Griswold Morley: "Chichen Itzá, an Ancient American Mecca," January, 1925; "Unearthing America's Ancient History," July, 1931; and "Foremost Intellectual Achievement of Ancient America," February, 1922; also "Home of a Forgotten Race—Mysterious Chichen Itzá, in Yucatán, Mexico," by Edward H. Thompson, June, 1914.



Star Photo by Luis Mardia

High and Steep Were the Temple Pyramids of the Maya

These crumbling ruins were part of the civic and religious center of Uxmal, Maya city of northern Yucatán. Founded about the year 1,000, it was the Athens of a league of city-states which brought to the peninsula two centuries of peace, prosperity, and high cultural attainment. Finest building triumphs of this Golden Age were at Uxmal. Maya-built pyramids of rubble and earth, faced with cut stones, some elaborately carved. One-story temples, with window-pierced superstructures, stood on summits.

help of mercenaries from upland Mexico the Itzás were vanquished; their famed city became a prize of the Mexicans.

Under new masters, Chichén Itzá flourished once more. The cult of Quetzalcoatl, the Feathered Serpent, gradually became dominant, and a new religious architecture replaced the old. Special attention was given stairways; they focused attention on ceremonials.

Narrow edgings gave way to wider borders; decorative terminals were added. The Aztecs divided temple stairs with a double rail, balancing the single one at either side; huge, fanged serpent heads formed rail ends for Toltec-Maya stairways.

A relatively late Maya temple at Hormiguero, in south-central Yucatán, features two towers each faced with a purely ornamental stair, the steps have $11\frac{5}{8}$ -inch risers, but only 4-inch treads.

One of the "palaces" at near-by Xpuhil has

three towers, each representing an idealized pyramid. Not only is the front decorated with a false stairway rising at an angle of 80 degrees, but each stair climbs to a false temple surmounted by a false roof comb.

From Mexico southward, the princely edifices of priests and potentates likewise rested on terraced platforms.

A Famous Peruvian Site

Pachacamac is one of Peru's most famous archeological sites (page 125). Its principal temple covers two-thirds of an acre and stands on a hill built of sun-dried adobe bricks.*

When the Incas conquered the city, about A. D. 1400, they spared the temple but built a bigger and better one to their own deity, the Sun. Rising in five terraces up the slopes of

* See "Finding the Tomb of a Warrior-God," by William Duncan Strong, NATIONAL GEOGRAPHIC MAGAZINE, April, 1947.



© Kurt Seiden from Black Star

Stylized Rattlesnakes Guard an Aztec Temple at Tenayuca, Mexico

Bared fangs ready to strike, they lie in close formation on a low ledge along three sides of the structure. Painted stucco veneer once added realism. At the end of each 52-year "century" Aztecs rebuilt their pyramids on a larger scale. Tenayuca's, six miles north of Mexico City, was rebuilt five times. Archaeologists found under-pyramids well preserved.

the highest natural hill in the vicinity, the Sun Temple covers approximately 12 acres. It, too, was built of clay bricks.

The Sun Pyramid at Moche, more than 130 feet high and 376,000 square feet in area, was also made entirely of billions of mud bricks. At Siptin a temple platform 75 feet high measures about 300 by 900 feet. When stone was lacking, clay was substituted.

Thus, north or south and irrespective of tribe, New World pyramids were foundations for buildings, nothing more. Egyptian pyramids, on the other hand, were superstructures for royal tombs cut in the rock beneath.

The traditional Egyptian tomb was the mastaba, a truncated pyramid of mud bricks overlying the burial vault. King Zoser's (Djoser) famous "Stepped Pyramid" at Saqq

ara, a novelty in 2700 B. C., was a half-dozen mastabas piled one upon the other, each smaller than that next below. When the resultant steps were filled in with hewn limestone to provide a smooth exterior, a new royal convention came into being.

Cheops's Pyramid at El Giza was the first true pyramid, designed and built as such.

The pyramid-building kings of Egypt ruled between 2700 and 2206 B. C. At that time the Western Hemisphere was still savage. Men lived by hunting and by gathering the seeds of wild plants. Horticulture and animal husbandry were far in the future. So, too, was the idea of a permanent place of worship.

The old Pharaohs had been dead a long while when Cortés, in 1521, laid waste the pyramid temples of Tenochtitlán and Cholula.

'Round the Horn by Submarine

By COMDR. PAUL C. STIMSON, U.S.N.

TH E CREW of the *Sea Robin* watched the sun rise over Cape Horn.

"It was a beautiful sunrise," our patrol report notes. "Weather was clear, and Cape Horn was worth coming 5,000 miles to see. The wind was blowing with gale force."*

About half the men aboard the submarine were amateur photographers. All were topside, and they went into action to record the event on film. For this moment—8:30 a. m. on June 1, 1947—meant more to us than the end of a 17-hour night. *Sea Robin* had just become the first U. S. submarine to round the Horn.

As a matter of fact, she probably was the first underwater boat of any nation to do so. The few German U-boats that operated in Pacific waters in war years, and the few Jap submarines that appeared in the Atlantic, so far as is known, passed around Cape of Good Hope 21° 38' farther north, on less adventurous voyages.

Gale Sends Crew Below

We were very fortunate to see the Cape so clearly. This southernmost point of the South American continent—a steep barren rock which rises 1,391 feet to a sharp summit—is cloaked in fog two days out of every three. Many voyagers around the Horn never see it.

But despite our good fortune, most of the volunteer cameramen had their fill of historical photography in a few moments. The cold gale sent them scurrying below to the four coffeepots which steamed constantly during this 55-day, 12,500-mile cruise of ours from Balboa, Canal Zone, to the Portsmouth, New Hampshire, Navy Yard. They learned the reason for the old warning, "Don't spit to windward at Cape Horn" (page 141).

We had met with plenty of nasty weather on our way south, even though we were running with the storms, and a one-to-two knot current was with us. I have seen rougher weather over short periods of time in the Pacific, but here it was consistently bad.

As we lay to at the Horn and rolled with the strong swell, I recalled the heavy gales and dense fogs we had passed through in the last week. Almost subconsciously my mind turned to thoughts of those early Spanish, Portuguese, Dutch, and English navigators

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, by Alan J. Villiers, "Rounding the Horn in a Windjammer," February, 1931; "Cape Horn Gaff-Ship Race," January, 1933; and "Inside Cape Horn," by Amos Burg, December, 1937.

who had sailed these stormy seas more than three centuries ago on their way to the Far East. In their tiny sailing vessels they had gallantly headed into the teeth of those gales, sailing from east to west.

The Horn was discovered in 1616 by the Dutch explorer, Willem Schouten. It doesn't resemble a horn in any respect. He named it after his birthplace, Hoorn, in the Netherlands.

I also was thinking of the old Nantucket and New Bedford whalers and sealers who came this way early in the 19th century in ships not much bigger than Schouten's, and of the daring skippers of the racing Clippers in the China trade (page 140).

I acquired a new and healthier respect for their ability in navigating without charts and modern instruments.

Submarine Travel Preferred

Compared with theirs, my job was not so bad. To any spot in the world, and that includes Cape Horn, I would rather travel in a submarine than in any other vessel. A submarine rides a storm much better than any other ship.

It is true that bridge personnel take a beating in rough weather, but lookouts can be relieved frequently. The crew, snug and warm, rests comfortably below in heaviest weather, and if a storm becomes terrific, you can always dive down to calmer waters.

The only risk then is in surfacing before the storm abates, because a submarine always goes through a period of instability when it is surfacing.

As the sun rose higher and only the hardiest members of the crew remained above deck, we set out again, passing Cape Horn four miles abeam to port.

The crew was elated. Now, according to some unsupported legends of which I was unofficially advised, it would not be necessary for the men to fasten the top buttons of their coats. Those who wore chin straps, so the story went, had earned the privilege of wearing them tucked up over their caps. At least they had heard that such special distinctions were their due.

Torpedoman John Harrington proudly proclaimed himself the first American submariner to round the Horn, since he was farther forward in the ship than anyone else (page 142).

Our journey had a twofold purpose—to carry out a training program in cold and rough weather, and to promote good will in the South American ports we touched.



Star Photographer Wilfred R. Culver

Motor "Mack" Coss Paints a Cape Horn "Hash Mark" on Conning Tower Fairwater

Beside it, at right, are *Sea Robin's* campaign ribbons. At top is the multicolored American theater badge; center, Asiatic-Pacific, with three gold stars marking "successful" war patrols; and bottom, Philippine Liberation Ribbon (two small blue and white stripes in center on a red background) with a gold star showing combat.

Sea Robin is a Fleet Type submarine, 311 feet long, with a 26-foot beam. She carries a crew of seven officers and 78 enlisted men.

She was launched at Portsmouth Navy Yard on May 25, 1944, and when she was commissioned on August 7 of the same year, I became her commanding officer. She has never gone to sea without me since that day.

Sea Robin Veteran of Pacific

Sea Robin made three successful long-range patrols in the Pacific during the war. She sank a Jap ship one night in the Java Sea, and three more the next. In all, she sank 13 enemy ships and picked up 33 prisoners while ranging in the western Pacific, East and South China Seas, Yellow Sea, and Indian Ocean.

Once she crept along, submerged deep, for four hours, while Jap destroyers and sub-

chasers dropped upon her all the depth charges they could muster.

She rescued two Army Mustang pilots down at sea, one off Hainan Island, the other south of Tokyo. She has made more than 1,100 dives and cruised over 100,000 miles.

Since the war, *Sea Robin* had been based at Balboa. I knew a training trip in rough waters was contemplated for her and requested the cruise around the Horn. To the joy of all hands aboard, the request was granted.

We left Balboa on May 15, with Lt. Comdr. E. E. Hopley as my executive officer. Thirteen of my men had been with me since *Sea Robin's* commissioning. Twenty-three, of whom twenty were brand-new men, were polliwogs—they had never crossed the Equator.

Also aboard were Patsy, my 18-month-old



From Paul C. Stimson

Sea Robin's Skipper Pays Tribute to Chile's Naval Heroes of Iquique

Commander Stimson (right center) placed the wreath on the Navy Monument in Valparaiso. The shaft commemorates the deaths of Capt. Arturo Prat and his gallant crew when their corvette, *Esmeralda*, sank with colors flying in a naval battle in the War of the Pacific in 1879, when Chile fought Peru and Bolivia.



H. V. Caser

Sea Robin Bites into an Angry Sea as She Heads Southward Toward the Antarctic

All too soon the rough weather test came to an end at 59° south, about 350 miles from the Antarctic Continent. Had storms become too severe, *Sea Robin* could have submerged to avoid rough seas and, at 60 feet below, found calm going.

English Springer Spaniel, who has made enough ocean trips to become a full-fledged sailor, and Lady, a small dog of doubtful lineage who was befriended by my Chief Motor Machinist Mate Hagopian in Key West, Florida.

Hagopian picked up the little mite there when she was so small she had to be fed from an eyedropper.

On May 17 we crossed the Line and got rid of the polliwogs in a rugged ceremony.

That formality out of the way, we began our academic schooling—courses in English, Spanish, mathematics, history, and mechanical subjects.

We also conducted work for the Navy Hydrographic Office, taking soundings by fathometer constantly, checking navigational aid information, and acquiring other chart data. Existing charts of both South Atlantic and Pacific coastal waters proved highly unreliable on many occasions.

Five days out from Balboa we encountered thousands upon thousands of water birds. We ran through them for several hours. One of the boys, mistaking them for ducks, shot one, then cleaned and cooked it. The cooked flesh tasted like extremely strong and somewhat overripe fish. Later we found out that it was probably a Peruvian cormorant.

Watch Lashed to Bridge

The weather became progressively worse as we proceeded southward. On May 22 we ran into a heavy storm. We took the lookouts below and lashed the quartermaster and officer of the deck to the bridge, to keep them from being swept overboard.

The twenty new crewmen, along with Patsy and Lady, were seasick. But we had a schedule to maintain, so we didn't bother to submerge, where the going would have been much easier, and *Sea Robin* rode out the storm in her usual gallant manner.



H. F. Case

Chile's President and First Lady Bid Farewell to *Sea Robin* after a Cruise Undersea

Side boys stand by to render honors as the couple (at left) crosses the deck to board their launch. This is an unusual mark of respect on a submarine, reserved only for special guests. The President and Mrs. Videla had just completed a 10-mile trip in dense fog, during which the sub navigated by radar. Both enjoyed two dives made during the run.

On May 24 we anchored in Valparaiso, Chile.* A heavy swell swept the harbor, and before we could look about it was necessary to pass heavy stern lines over to the seawall to keep us steady.

Then we could pause to see the famous old harbor, surrounded by its shore-line business district, with pleasant suburbs looking down on both from the encircling hills.

Capt. Paul Weaver, at that time U. S. Naval Attaché, and Capt. Oberlin C. Laird, chief of the U. S. Naval Mission to Chile, were on hand to greet us. We called on the commander in chief of the Chilean Navy, Vice Admiral Emilio Daroch, and other Chilean officials.

There followed a round of royal welcoming. The Chilean Navy put an admiral's barge at my disposal, and *Sea Robin*'s officers were entertained at one social function after another, in extremely hospitable style.

The enlisted men went on a sight-seeing

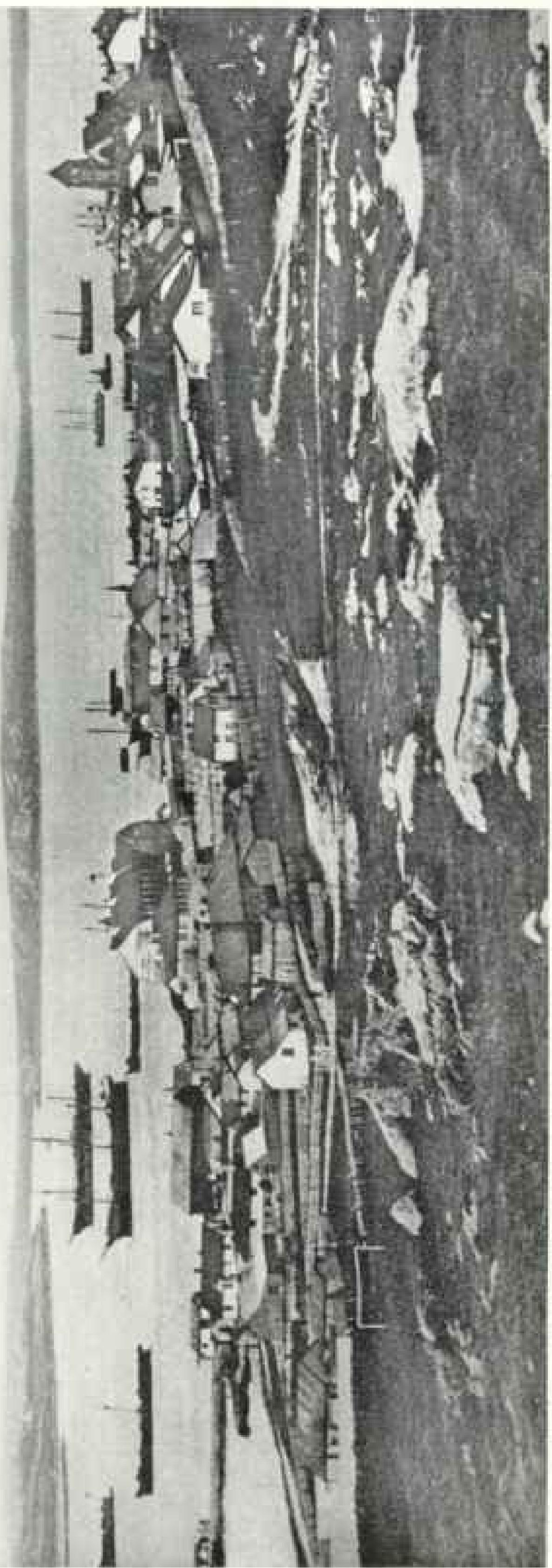
jaunt to Santiago, Chile's capital, 116 miles away by rail, but the officers couldn't go—the program of entertainment in Valparaiso was too crowded to permit them to make the trip.

Climax of the first day's festivities was a dinner at the Presidential Palace, where both President Gabriel Gonzalez Videla and his youthful and attractive blond wife expressed a desire to take a dive in *Sea Robin*.

Chilean President Goes Aboard

I readily agreed. The next day a party of 14 Chileans, including Señor and Señora Gonzalez Videla, came aboard. We ran 10 miles out to sea in a dense fog to demonstrate navigation by radar. Both out and in, the President and his wife stood on the bridge, although it was very cold.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Twin Stars of Chile," by William Joseph Showalter, February, 1929; and "Capital and Chief Seaport of Chile," by W. Robert Moore, October, 1944.



Sheep Raisers of the Falklands, off the Argentine Coast, Entertained U. S. Submariners with Dances and Penguin Hunts

Sea Robin put in to Port Stanley on her return from southern waters. The skipper tried to find a penguin for his small daughters, but fortunately for the bird he was unsuccessful. The girls had tentatively arranged with their grandmother in Danville, Virginia, to keep such a pet in the electric refrigerator (page 143).

From Paul C. Stimson

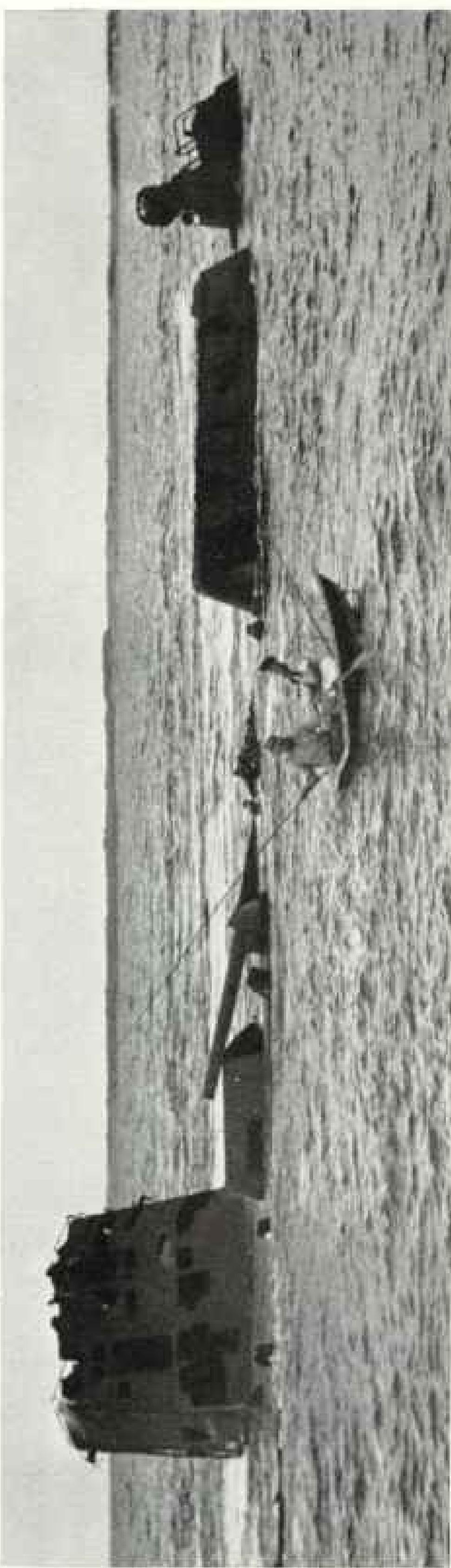
With Chile's President Abouard, *Sra. Rojas* Weighs Anchor for a Test Run out of Vulpuriso

On deck, left to right, are Vice Adm. Emilio Dartoch, Commander in Chief of the Chilean Navy; Comdr. Paul C. Stimson, skipper of the submarine; President González Videla; Capt. Rafael Silva, his aide, and Capt. A. M. Zollars, U. S. Naval Mission to Chile. Mrs. Videla also accompanied her husband. (page 133).





From Paul C. Strimme
San Robin, Veteran of Many Oceans, Shoves Off from Balboa, Canal Zone, for Her Cruise Around the Horn
Only three years old, the submarine has roundt the North and South Atlantic, North and South Pacific, Indian Ocean, Java Sea, Banda Sea, South and East China Seas, and the Yellow Sea. During the war she sank 13 Japanese ships.

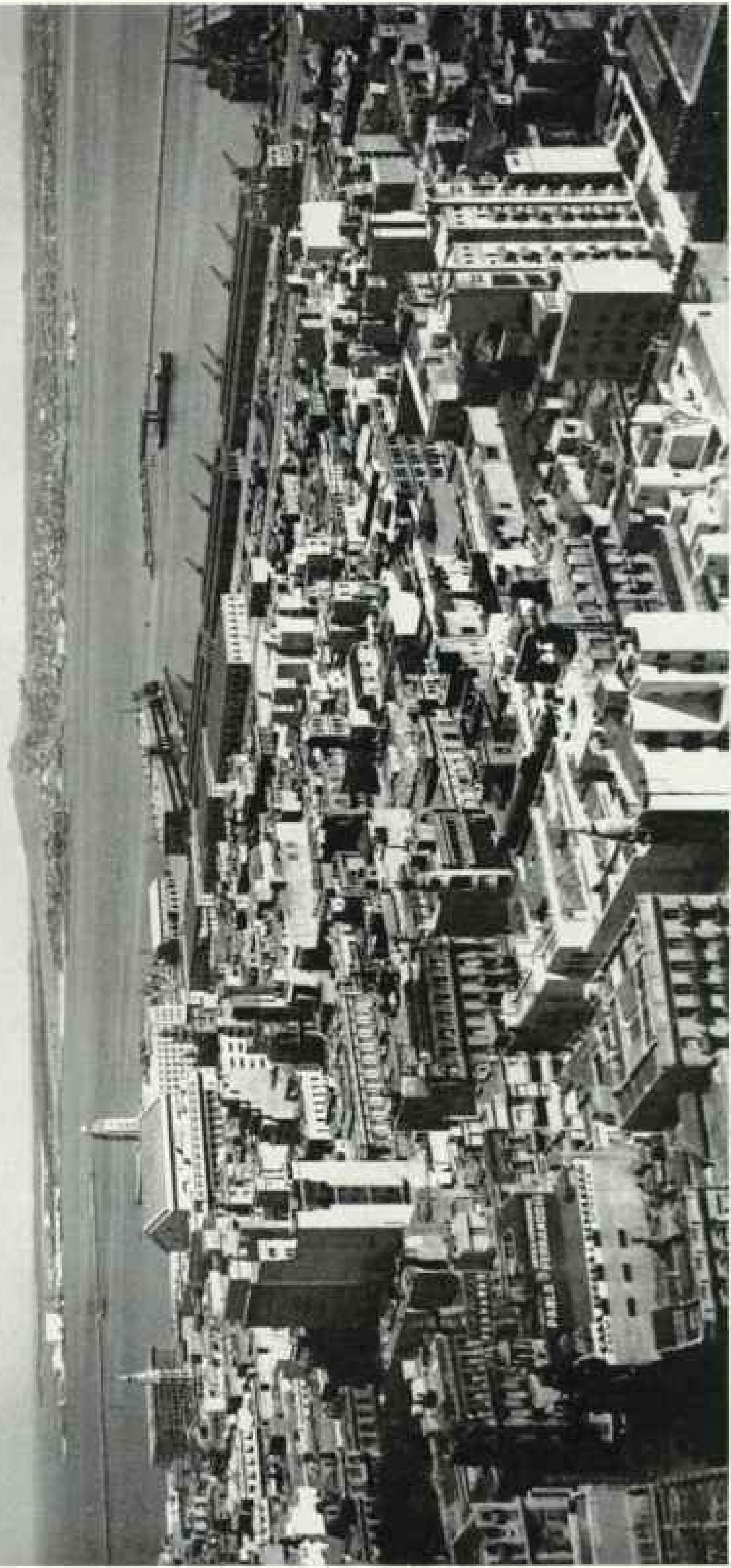


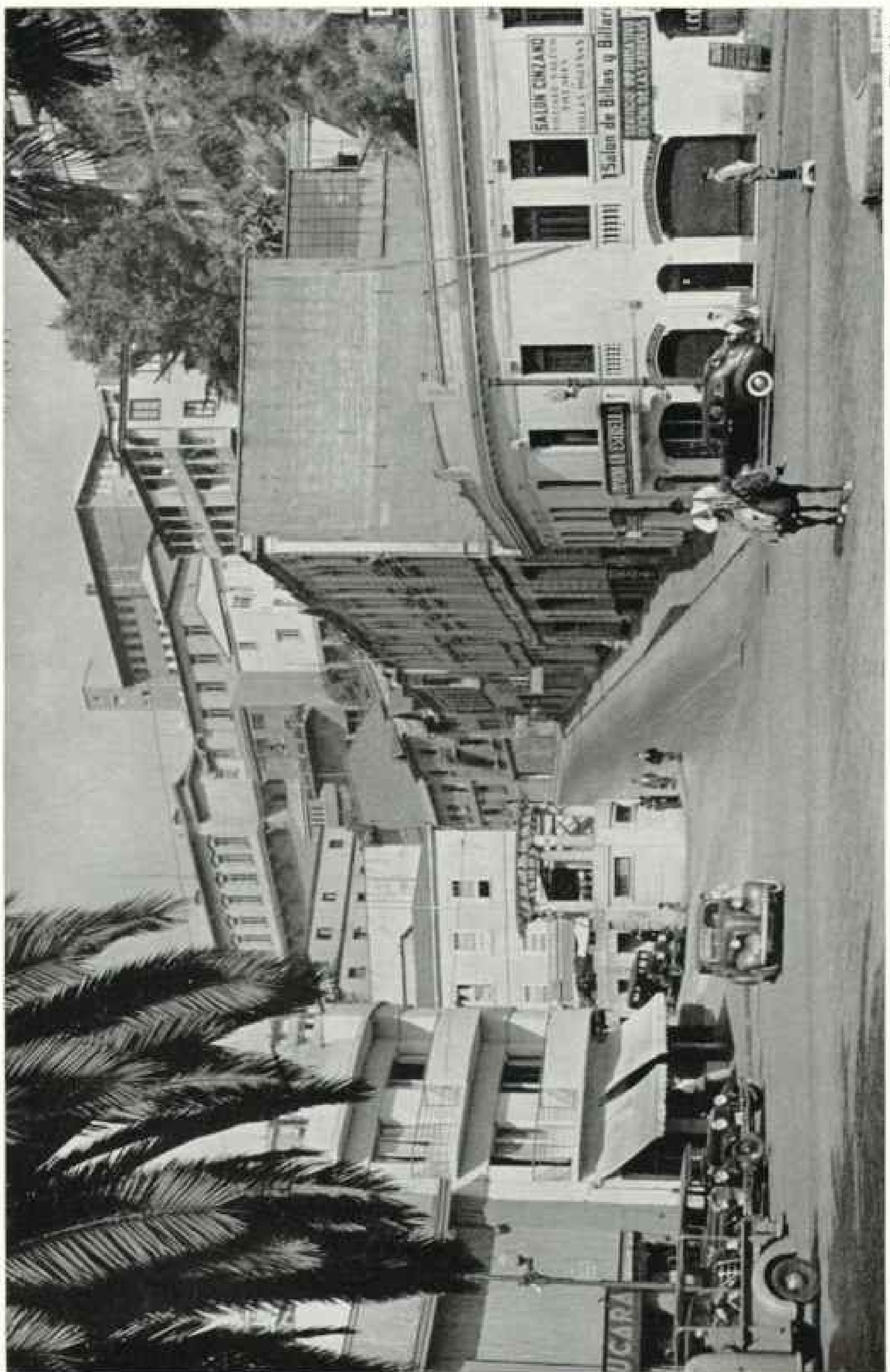
*Wreckage of the *Graf Spee*, Nuxi Battleship Sunk in 1939, Struck Weakly at Sea Robin as She Entered Montevideo Harbor*

Left: Photograph by Luis Mariano

Up the Rio de la Plata Sea Robin Pushed, to Dock at Montevideo's Water Front

Uruguay's capital fronts on a modern, \$50,000,000 harbor. In background rises loft-clad, 463-foot El Cerro, landmark for navigators. Before leaving, the submarine engaged in joint maneuvers with the Uruguay Maldonado, a former United States P. C. boat (page 144).





Three Links

In Valparaiso U. S. Submariners Trend Streets Familiar to Old Yankee Whalers

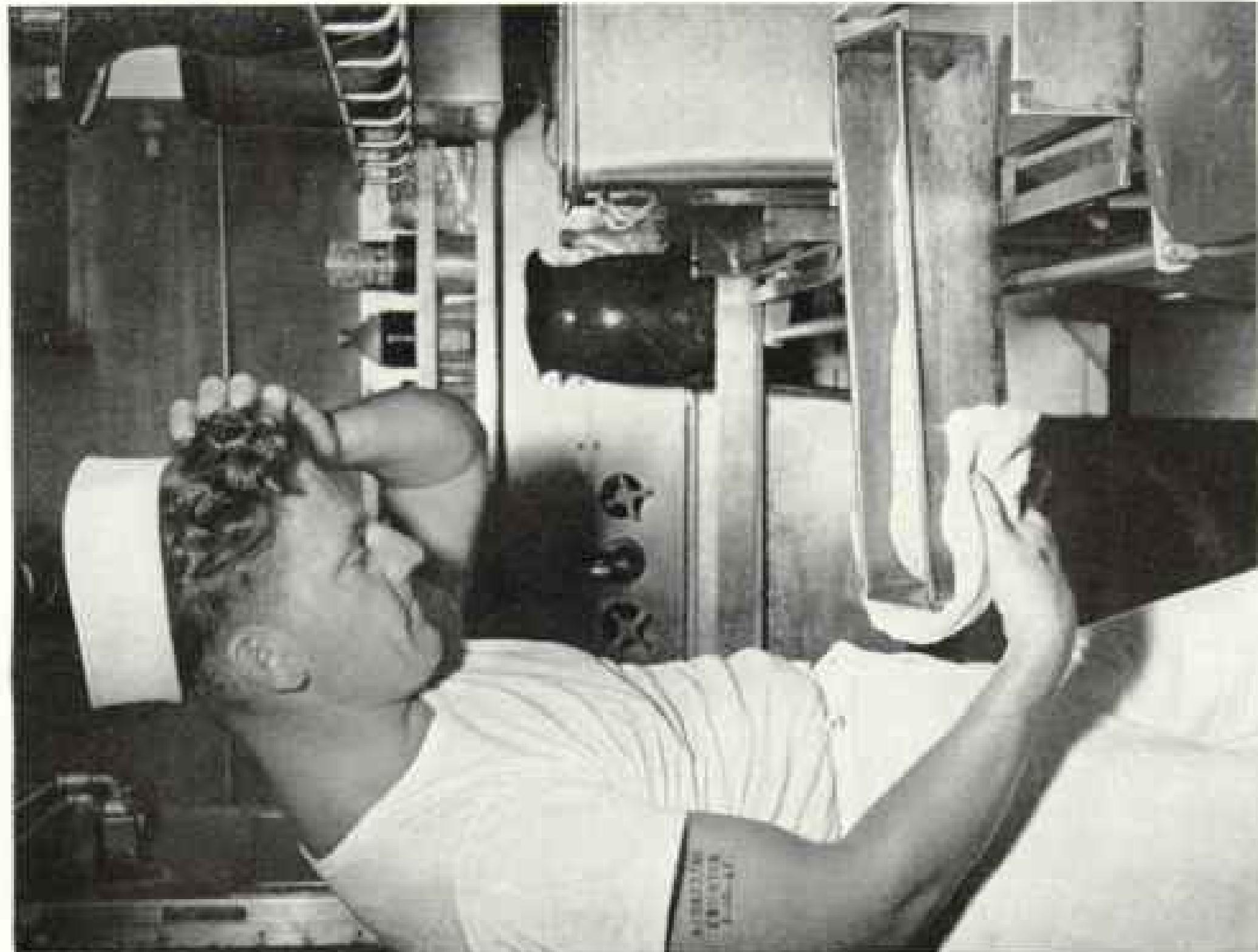
Once one of Spain's principal ports in the Pacific, Valparaiso was a haven for storm-battered North American merchantmen in the 19th century. See Robin's Whelked men, on shore leave, enjoyed a jaunt to Santiago, Chile's capital, 116 miles away.

Courtesy Winfield H. Chase



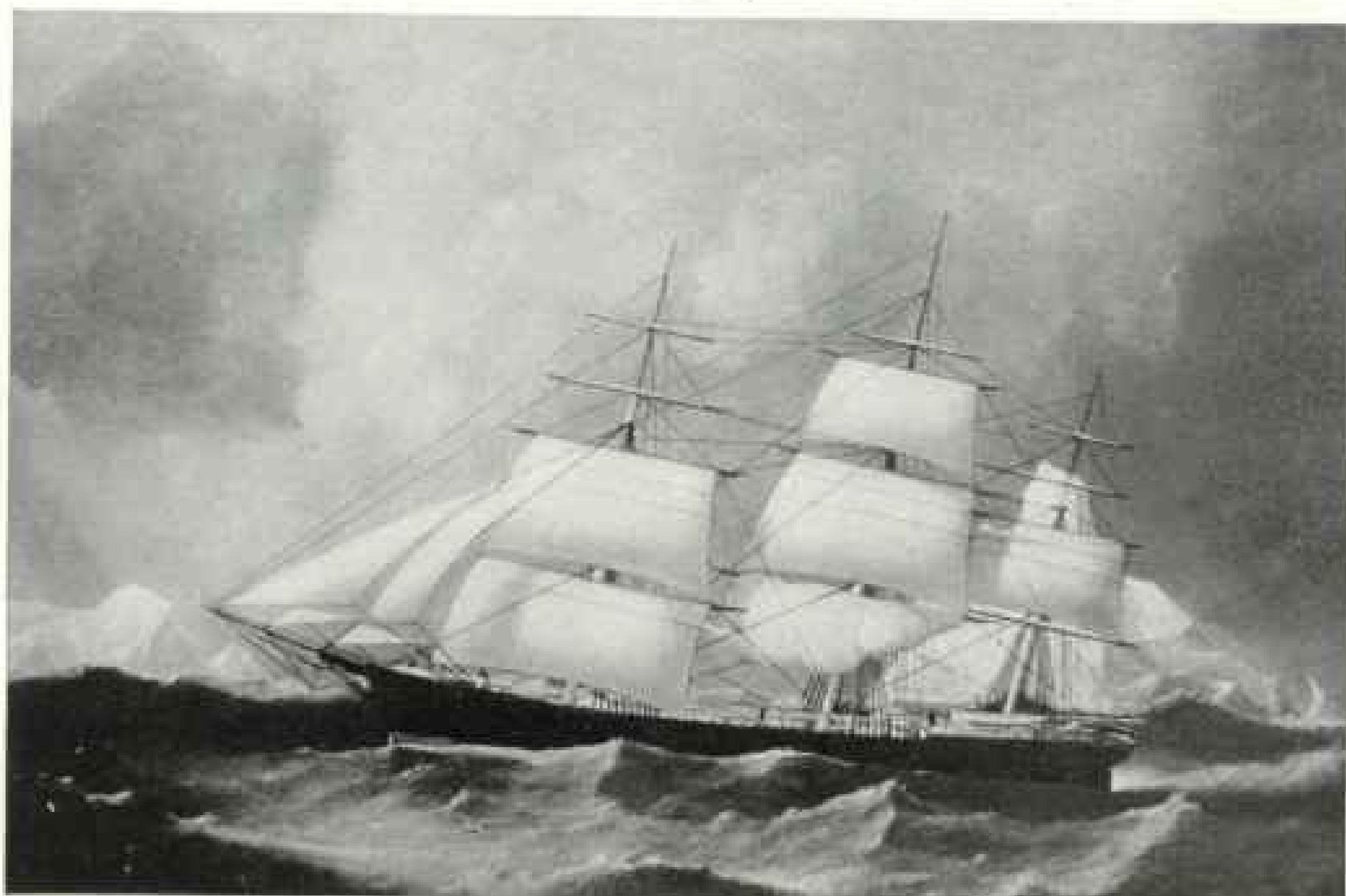
It's "Down the Hatch" for Patsy

H. F. Casey, Signalman Second Class, carrying the ship's mascot, an English Springer Spaniel, below. Whenever *Sea Robin* submerges, Patsy took her stand in the control room. The rest of the time she stuck close to the cook.



"I Wish They'd Tell Me When They're Going to Dive!"

John Montgomery, one of *Sea Robin's* bakers, takes a ruinful glance at his "fallen" bread dough. When air pressure is built up in the ship just prior to a dive, to make sure all openings are closed, the rising batch falls flat as a pancake.



Peabody Museum; from Bettmann Archive

Flying Cloud Rounds the Horn on Her Record Voyage from New York to 'Frisco

Sea Robin, on her Pacific-Atlantic passage, followed the stormy course ships took before the Panama Canal was built. *Flying Cloud*, 1,783-ton clipper, and the largest merchantman in her day, made her pace-setting run in 89 days and 21 hours in 1851. Built by Donald McKay, the famous clipper has been immortalized in painting and poetry. This illustration is from an old lithograph by J. and F. Tudor.

We bundled both of them in submarine clothing, including face masks, and they seemed to enjoy it (pages 133 and 135).

Then we made two dives, and they liked them immensely. All of us got a real thrill out of entertaining our presidential guests.

Dominating Valparaiso harbor is the huge Navy Monument, surmounted by a statue of the Chilean hero, Capt. Arturo Prat, who lost his life when his antiquated corvette, *Esmeralda*, sank with colors flying in the Battle of Iquique, during the War of the Pacific in 1879. Here, in an impressive ceremony, I laid a wreath (page 131).

A School of Whales

Twenty-four hours out of Valparaiso we ran into a big school of whales. They were all around us.

They reminded me of an occurrence in the South Pacific on an earlier trip. *Sea Robin* was proceeding slowly when suddenly she struck something. The whole ship shuddered. I thought she had run aground. But immediately we discovered that a big whale had decided to surface and blow right in front of us—worse luck for it.

Sea Robin was not damaged, but the whale was—irreparably.

An angry whale once sank the whaling ship *Essex*, and on this event Herman Melville based his account in *Moby Dick*. But *Sea Robin* isn't to be treated with contempt by whales—she's too rugged.

At 40 degrees south we saw a school of what we took to be porpoises, except for the fact that they were snow-white with black dinner-jacket markings similar to penguins. There were about 15 of them, and they passed a quarter of a mile from us, heading north and swimming fast. They didn't turn and swim with the ship as porpoises usually do.

We had never seen this kind before and could not identify it. Upon our return to the United States we learned that these porpoises probably are a variety known by the formidable scientific name of *Lagenorhynchus cruciger*, and are cousins of the white-sided dolphin (*Lagenorhynchus acutus*) which roams the North Atlantic.*

As we sailed farther south the fog settled

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "Whales, Giants of the Sea," by Remington Kellogg, January, 1940.



From Rear Admiral A. Hanson Merrill, U.S.N.

Cape Horn Abeam! *Sea Robin* Reaches Her Goal, the Tip of South America

All hands braved a gale to scramble topside as the sun rose and the clouds obligingly lifted to give them a splendid view. But cold winds soon sent them below to four pots of steaming coffee (page 129). *Sea Robin* passed Cape Horn four miles off, and the history-making event was entered on the log. This picture, at much closer range, was made ten years ago by then Commander Merrill while he was a guest aboard a naval vessel, part of a Chilean squadron which sailed around the Horn on a 5,000-mile cruise.

down, and we could not take navigational sights for many days. We kept about 20 miles off shore. By May 30 we made landfall on Evangelistas Light, at the western end of the Strait of Magellan.

Heading into the Strait

We headed into the Strait during the night, with the wind blowing and the rain coming down in sheets. For 20 miles we worked our way inward, navigating with ease and confidence through the miracle of radar. Then, before dawn, we turned back, pulled clear of the Strait, passed Desolation Island at 5 a. m., and submerged in a smooth sea. We stayed below until noon and engaged in some tests.

We always had a slight difficulty with ship's baker when it came time to submerge, and this was no exception. He insisted on being notified personally, because the compression in the boat upon diving always could ruin any batch of bread dough he might be making.

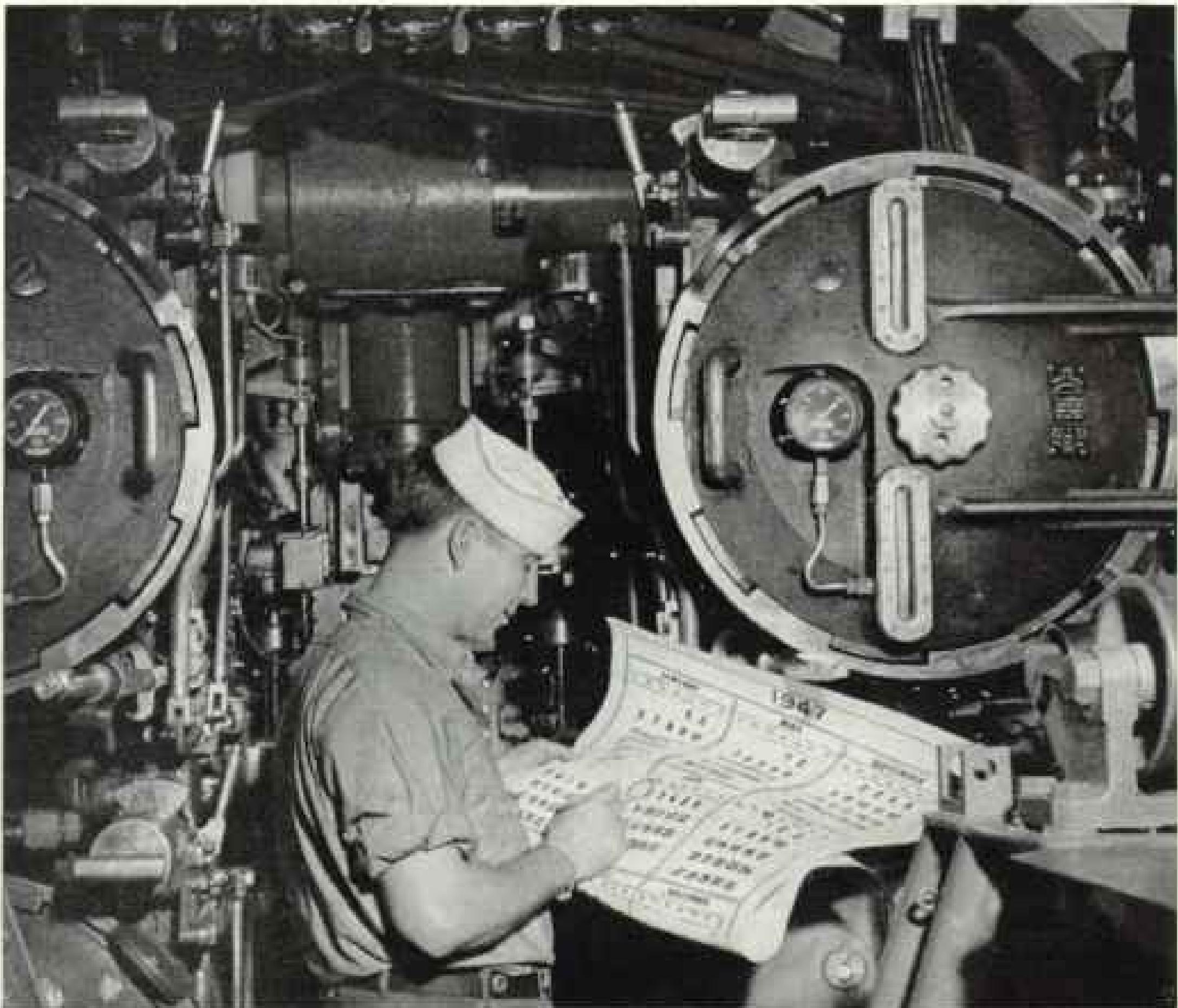
The dough fell, he insisted, instead of rising, and he warned that if we didn't give him ample warning, we would all be eating hard-tack! (Page 139.)

Patsy also had her eccentricities during submerging and surfacing operations. Whenever either began, she would make a beeline to the control room, no matter where she might be on the ship. It seemed as though she wanted to be in the best spot to observe the success of the operation. The rest of the time she never strayed far from the galley, having learned early where her meals came from (page 139).

When we surfaced this time, we encountered a gale blowing from the west, and soon experienced a storm worse than we had anticipated, even near the Cape. We lashed our watch to the bridge again. This time the storm lasted 48 hours, but *Sea Robin* rode it out pluckily.

When it abated we could see to the east the forbidding shore line, about 20 miles away, and beyond it the snow-capped hills of desolate Tierra del Fuego. Locations of scores of wrecks dotted the charts. We were about to draw abreast of Cape Horn.

After our view of the Cape we headed eastward for a few miles, then turned south. Even as we were departing, rain squalls began to close down on the Horn and in a few moments had enveloped it.



Staff Photographer Willard R. Culver

First Submariner Around the Horn? Yes—He Stood Farthest Forward!

John Harrington, TM2SS, "chocks off" June 1, the day *Sea Robin* reached the Cape. He was stationed here at that time, between the breech ends of the bow tubes (page 129). The gauges measure the pressure in the tubes, and sight glass on the breech door tells the amount of water in each.

We headed south because our plans called for a brief rough-weather test in sub-Antarctic waters. Watching for icebergs, we proceeded south all day and at midnight were at a point about 59 degrees south, some 350 miles from the Antarctic Continent (page 132).

It was a disappointment to me to turn north here. One more day on this course and we would have touched at Palmer Peninsula. But we had a schedule to keep and had to go back.

The Falklands, Britain's Farthest South

The next afternoon we reconnoitered Burdwood Bank, a poorly charted shoal a hundred-odd miles south of the Falkland Islands, and obtained data for the Navy Hydrographic Office.

The next day we submerged for brief tests south of the Falkland Islands and 24 hours later sailed into Port Stanley, where we were

greeted by Commander Marshall, British naval officer in charge of the Falklands' chief port, and Mr. A. B. Mathews, Colonial Secretary.

We anchored in the harbor, for there were no docks with enough water for us. *Sea Robin* draws 17 feet (page 134).

We received a most cordial welcome. Local officers told us we were the first American warship to visit the islands in 50 years, and the first U. S. ship of any kind to call for 20 years.

The Falklands, southernmost colony of the British Empire since 1833, are a rocky group of islands lying more than 300 miles east of the Strait of Magellan. The principal islands are East and West Falkland.

Of the 2,400 inhabitants, nearly half live in Port Stanley. Nearly all of them are English, Scottish, or Irish. Their only important industry is sheep raising.



ARMED
FORCES

Unofficial Insignia Proclaims *Sea Robin's* Trail-blazing Run 'Round the Horn

Map and legend, "Cape Horn," were devised by the crew to mark the first journey of a U. S. submarine around the tip of South America. On right are the ship's campaign ribbons (page 130). Above the skipper, Comdr. Paul C. Stimson, is the ship's battle insignia, drawing of a sea robin. This fish walks along the bottom of the ocean, using pectoral fins for "feet." In the drawing, it clutches a torpedo in its walking fins!

Cold and bitter winds blow almost constantly. The thermometer, while we were there, ranged between 30 and 40 degrees. The only source of fuel is peat.

But the warmth of hospitality shown was in direct contrast to the weather. On both nights of our stay, dances were held for the crew. Our men got along famously with the Falkland girls. In the daytime the boys were entertained in the homes of the ranchers.

The officers enjoyed a hunting trip and a visit to a penguin rookery. My two very small daughters were anxious to have me bring them a penguin. They had asked their grandmother if it would be reasonable and possible to keep it in the Frigidaire! But the penguin nesting season had long since passed, and their rookeries were occupied by a few big hares.

In the harbor with us was a Diesel-propelled English whaler, whose men were after a load

of geese for provisions to take farther southeast into the South Georgia region, a Falklands dependency, where they had their base.* Falkland Islanders receive a small bounty on every goose they kill, for the birds are unwelcome—they eat up the sheep pasturage!

From the Falklands we headed for Montevideo, capital and port of Uruguay. En route, cruising 250 feet below the surface, well out at sea, we hit a submerged pinnacle. A sounding taken a minute before had shown 13 fathoms below us.

An Obstruction Not on the Charts

Suddenly the *Sea Robin* jolted heavily. She was making between five and six knots. We came up a few fathoms without incident and everything seemed to be in good shape—we

* See, in the NATIONAL GEOGRAPHIC MAGAZINE, "South Georgia, an Outpost of the Antarctic," by Robert Cushman Murphy, April, 1922.

weren't taking any water. Some moments later we surfaced and examined the ship, but found no signs of damage. Of course there was no indication of any such obstruction on the charts.

On June 10 we sailed up the Rio de la Plata, passing the wreckage of the German *Graf Spee*, trapped in Montevideo by British men-of-war in the sensational naval battle of December, 1939, and scuttled by its crew. The wreckage lies a few miles west of the channel (page 136).

Montevideo Now a Modern Port

Montevideo once had a shallow and exposed harbor, but before World War I it had been converted into a modern port through a huge program of dredging and breakwater building which cost more than \$30,000,000.

Today it is one of the world's important ports, from which Uruguay sends many tons of meat every month to many parts of the world (page 137).

Capt. Forrest Tucker, U. S. Naval Attaché, and Uruguayan officials greeted us at Montevideo, and we entered upon a round of extremely cordial festivities.

On the second day, the *Sea Robin's* officers were the guests of the Inspector General of the Uruguayan Navy at a luncheon. Heretofore on public occasions, I had confined all my remarks, including responses to toasts, to English. But this time I ventured a little speech in Spanish.

When I was graduated from the Naval Academy at Annapolis eleven years ago, I was reasonably proficient in Spanish, but when I tried to brush up on it at the start of this trip, I found I was woefully rusty. So I obtained some of the ship's textbooks and studied all the way around the Horn.

Whether I acquitted myself well in Spanish at the luncheon, or whether my hosts were too polite to criticize me, I have not been able to decide. But it encouraged me to speak Spanish again later in a radio interview. If there were any complaints about this talk, the broadcasting people didn't tell me.

Uruguayan naval officers were particularly interested in *Sea Robin*. Because of her war record, we held open house for them. On the day of our departure we conducted joint exercises with R.O.U. *Maldonado*, a former United States P. C. boat.

I took 13 Uruguayan officers aboard *Sea*

Robin for this event, and one of my officers was aboard the *Maldonado*. After the exercises the *Maldonado* acted as a courtesy escort, accompanying us at sea until dusk.

We enjoyed our stay in Montevideo. The conduct of the crew was exemplary. As a matter of fact, we had no unpleasant incidents anywhere we called. Incidentally, we took aboard at Montevideo 900 pounds of succulent tenderloin steak, which cost twenty cents a pound!

Leaving Montevideo, we resumed our hydrographic work and our training. We proceeded without incident until June 22. On that day we had submerged and were cruising very deep, when suddenly, without warning, some of the packing in the starboard stern tube blew out, and we took on some water. We surfaced, put the compartment under pressure, and repacked the tube.

A View of Devil's Island

Nearing French Guiana, we inspected Devil's Island from a distance of three and one half miles.

We were surprised to find that it rises to a height of about 400 feet and presents a pleasant tropical scene, without a swamp, and apparently mosquito and alligator free—not exactly what movie thrillers had led us to believe. But the mainland, which we had seen from about seven miles offshore, seemed all swampland.

We entered the Gulf of Paria—that body of water closed by Trinidad and the Venezuelan coast—by way of the Serpent's Mouth, and stopped at Port of Spain for a day. We left the Gulf by way of the Dragon's Mouths, pushed on through the Lesser Antilles, and called briefly at Bermuda.

By July 7 we had reached New London, Connecticut, where we were met by Rear Admiral James Fife, Jr., Commanding, Submarine Force, Atlantic Fleet. Then we headed for the Cape Cod Canal on the last leg of our voyage.

But apparently Massachusetts wanted to show us a thing or two about fogs herself. So dense a fog settled down that the Canal was closed to all traffic, delaying our arrival at Portsmouth by about six hours. The weather was warm, no gale was blowing, but that fog was almost as heavy and impenetrable as anything you will find around the Horn.

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To carry out the purposes for which it was founded sixty years ago, the National Geographic Society publishes this Magazine monthly. All receipts are invested in The Magazine itself or expended directly to promote geographic knowledge.

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In addition to the editorial and photographic surveys constantly being made, The Society has sponsored more than 100 scientific expeditions, some of which required years of field work to achieve their objectives.

The Society's notable expeditions have pushed back the historic horizons of the southwestern United States to a period nearly eight centuries before Columbus crossed the Atlantic. By dating the ruins of the vast communal dwellings in that region, The Society's researches solved secrets that had puzzled historians for three hundred years.

In Mexico, The Society and the Smithsonian Institution, January 16, 1930, discovered the oldest work of man in the Americas for which we have a date. This slab of stone is engraved in Mayan characters with a date which means November 4, 320 A. D. (Spinden Correlation). It antedates by 200 years anything heretofore dated in America, and reveals a great center of early American culture, previously unknown.

On November 11, 1933, in a flight sponsored jointly by the National Geographic Society and the U. S. Army Air Corps, the world's largest balloon, *Explorer II*, ascended to the world altitude record of 72,395 feet. Capt. Albert W. Stevens and Capt. Orvil A. Anderson took aloft in the gondola nearly a ton of scientific instruments, and obtained results of extraordinary value.

The National Geographic Society-U. S. Army Air Forces Expedition, from a camp in southern Brazil, photographed and observed the solar eclipse of 1947. This was the seventh expedition of The Society to observe a total eclipse of the sun.

The Society cooperated with Dr. William Beebe in deep-sea explorations off Bermuda, during which a world record depth of 3,028 feet was attained.

The Society granted \$25,000, and in addition \$75,000 was given by individual members, to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees in the Giant Forest of Sequoia National Park of California were thereby saved for the American people.

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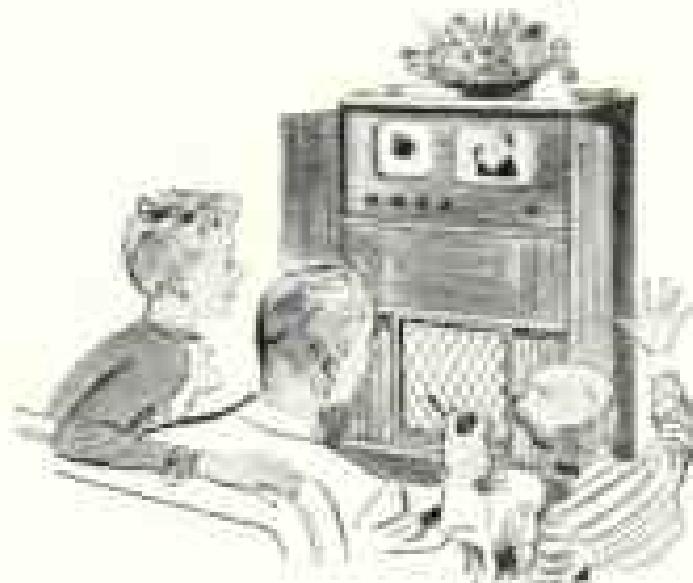


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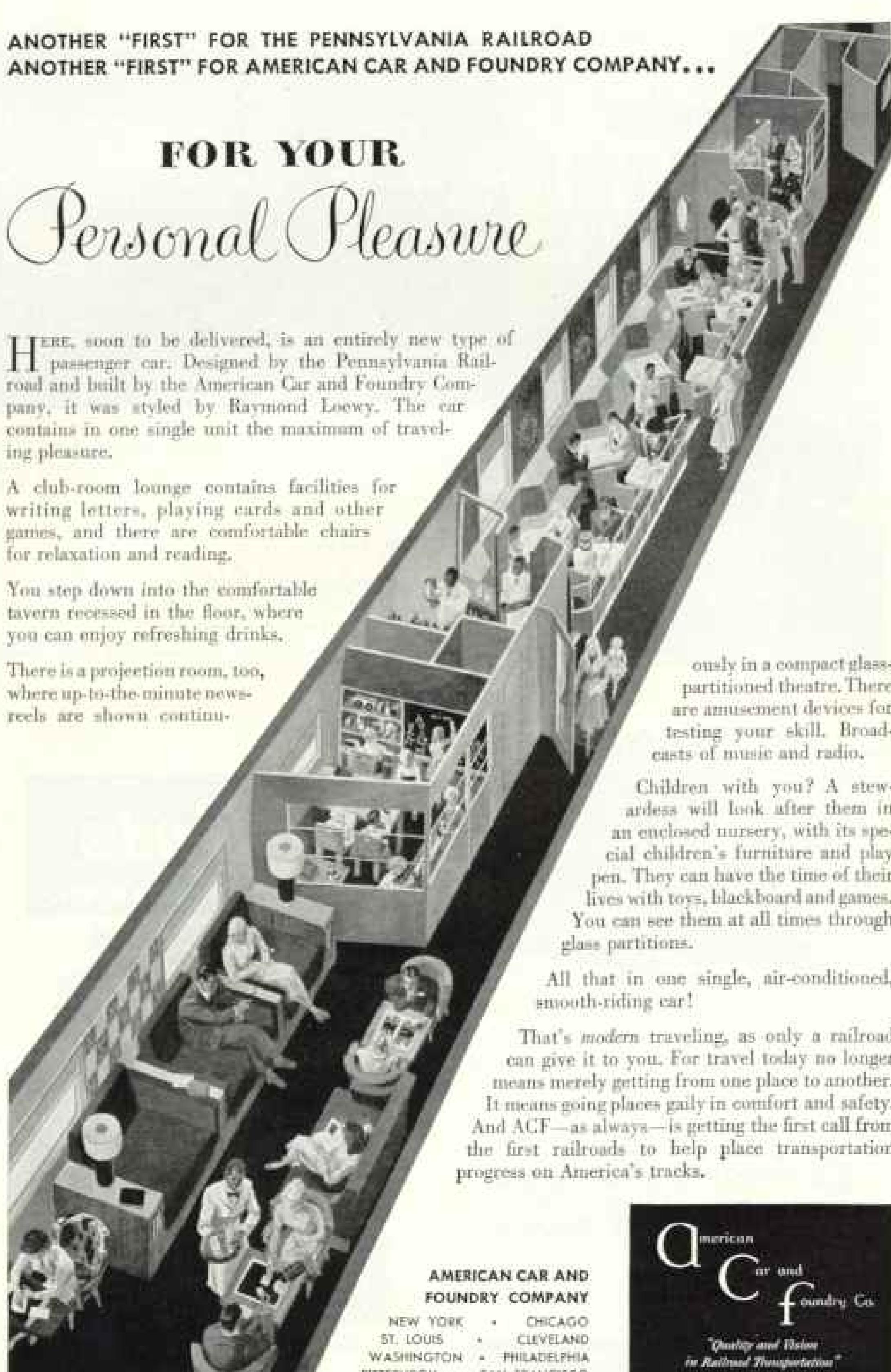
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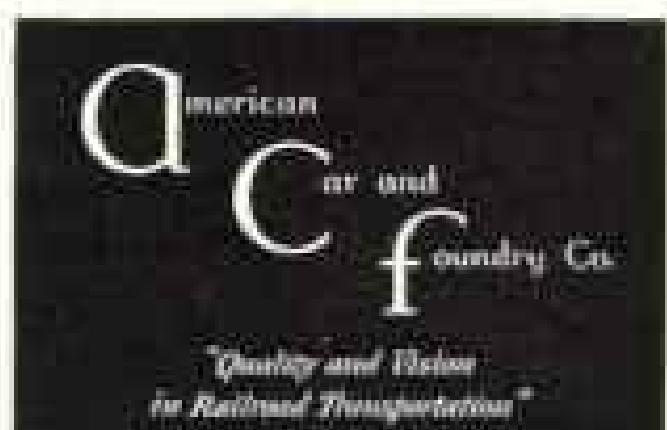
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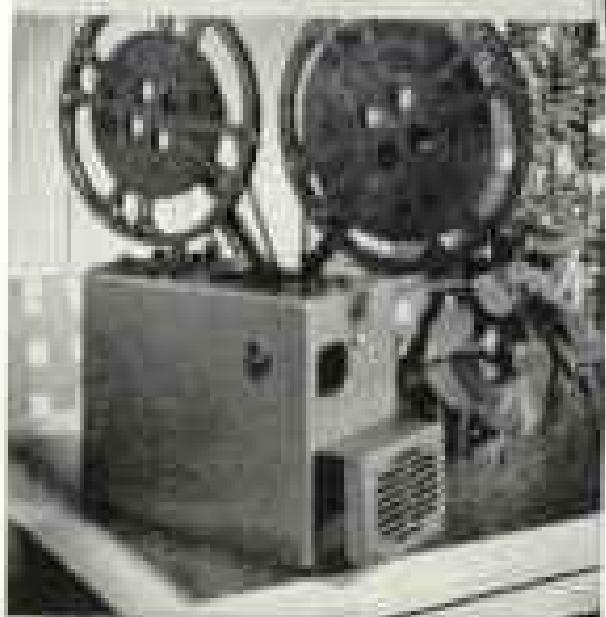


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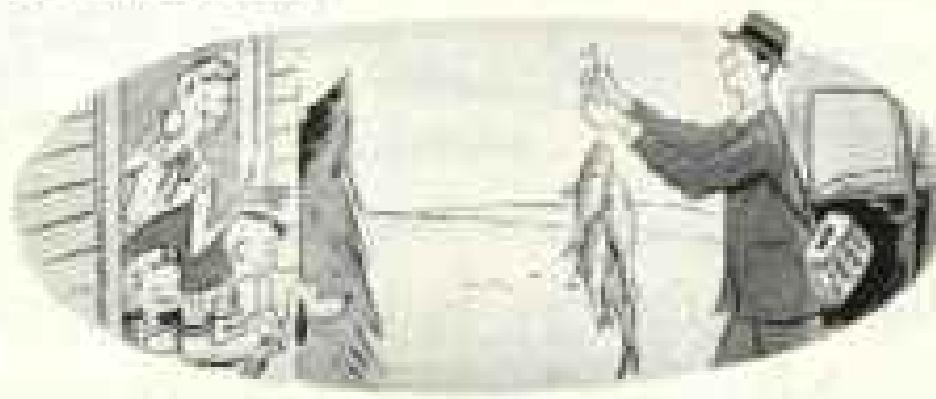
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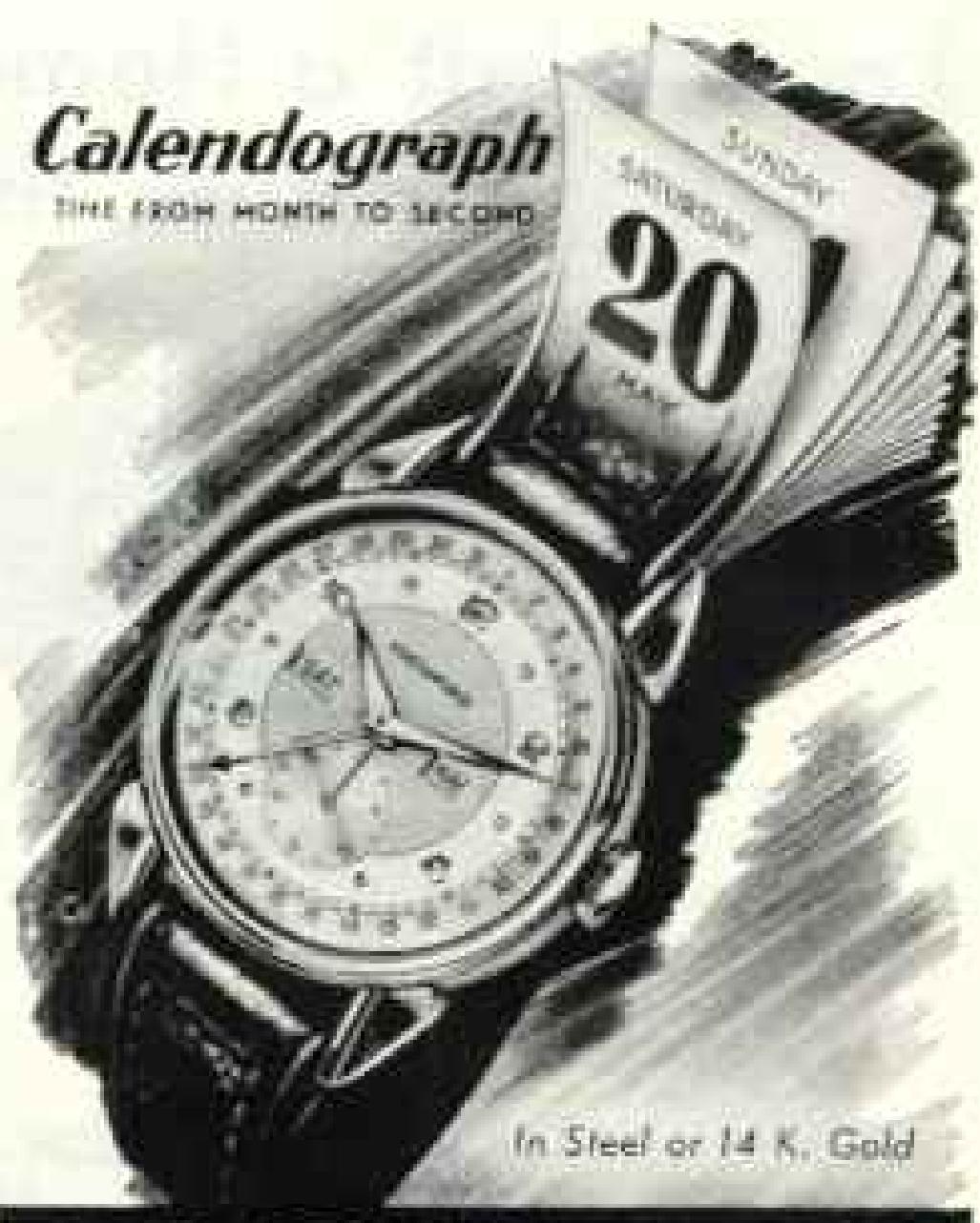
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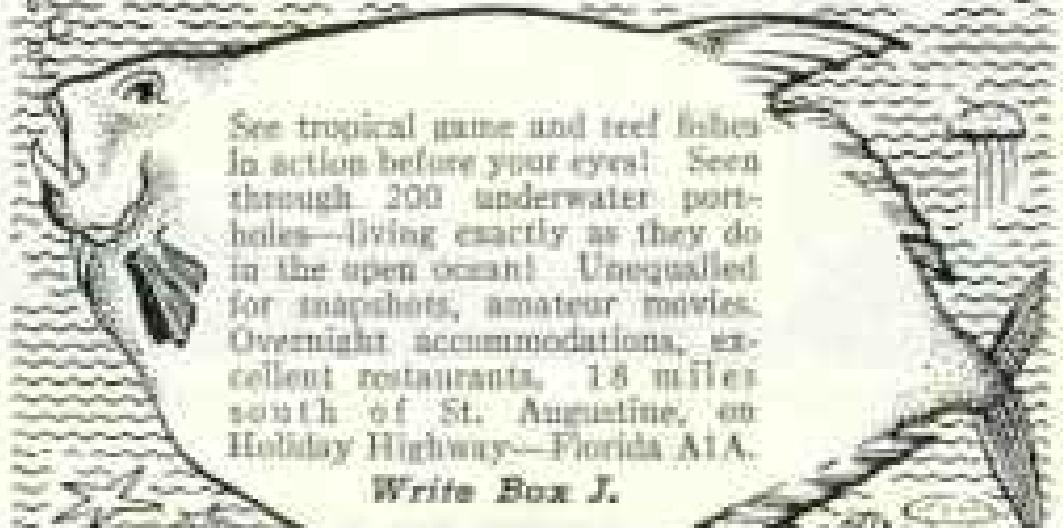
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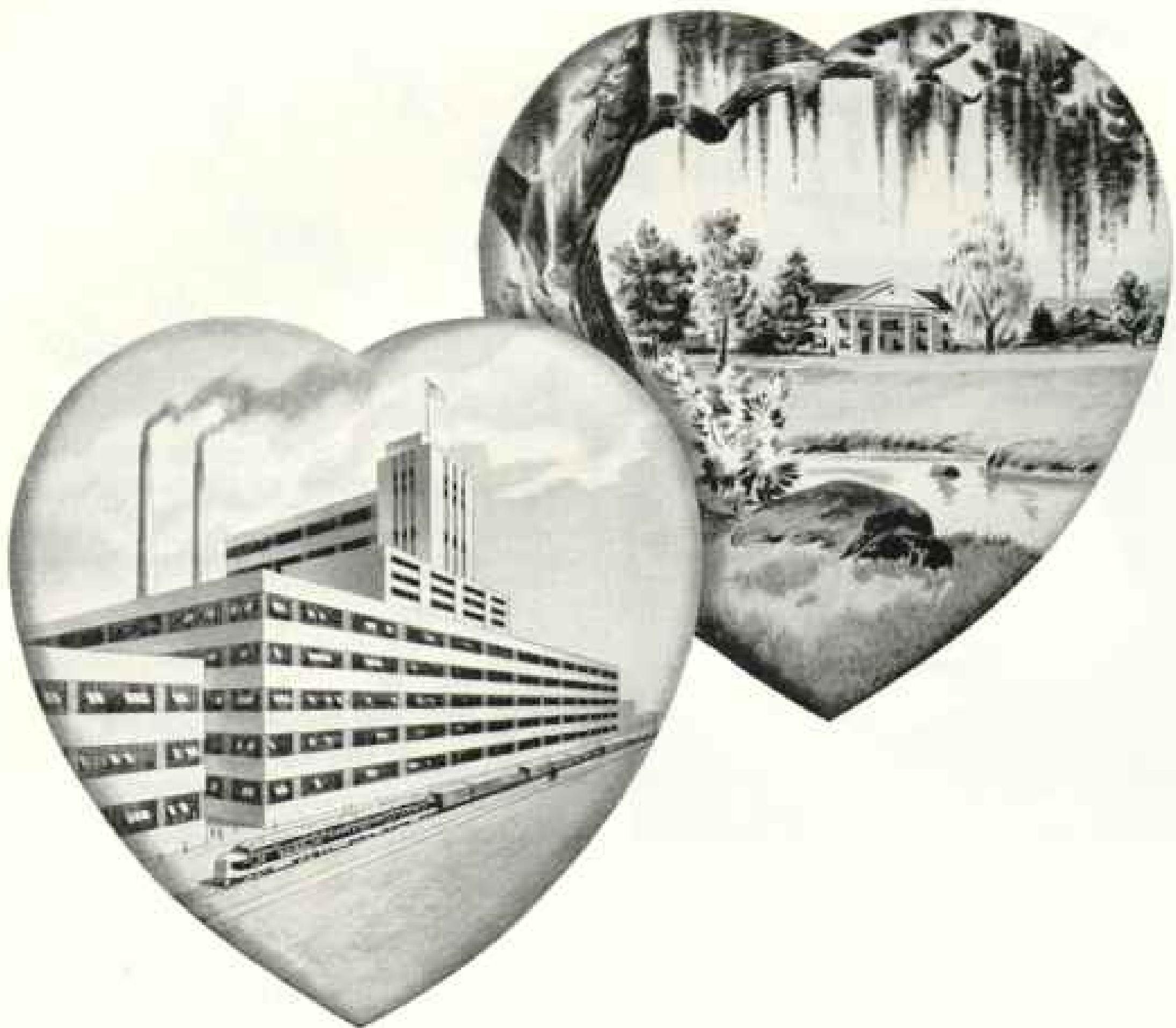
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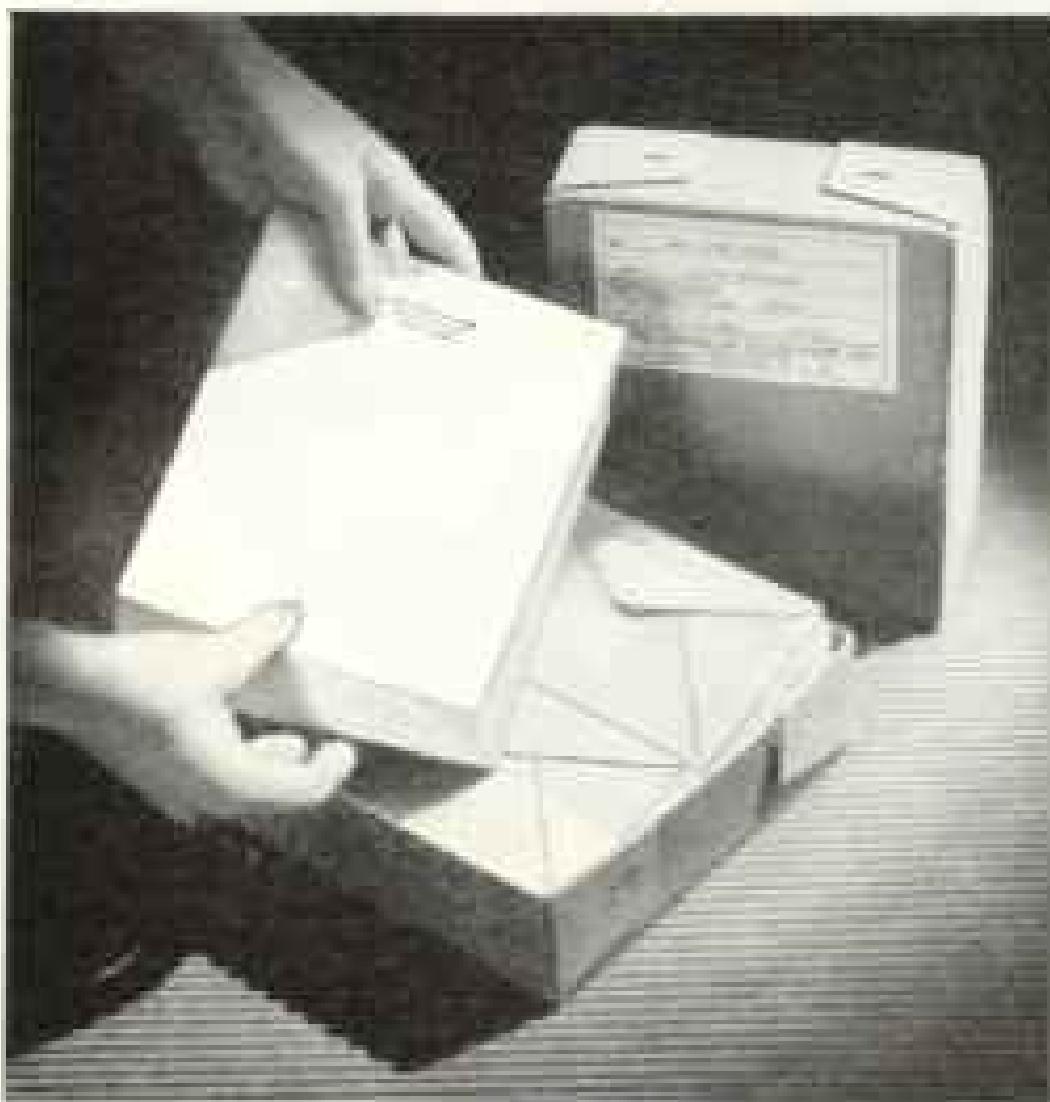
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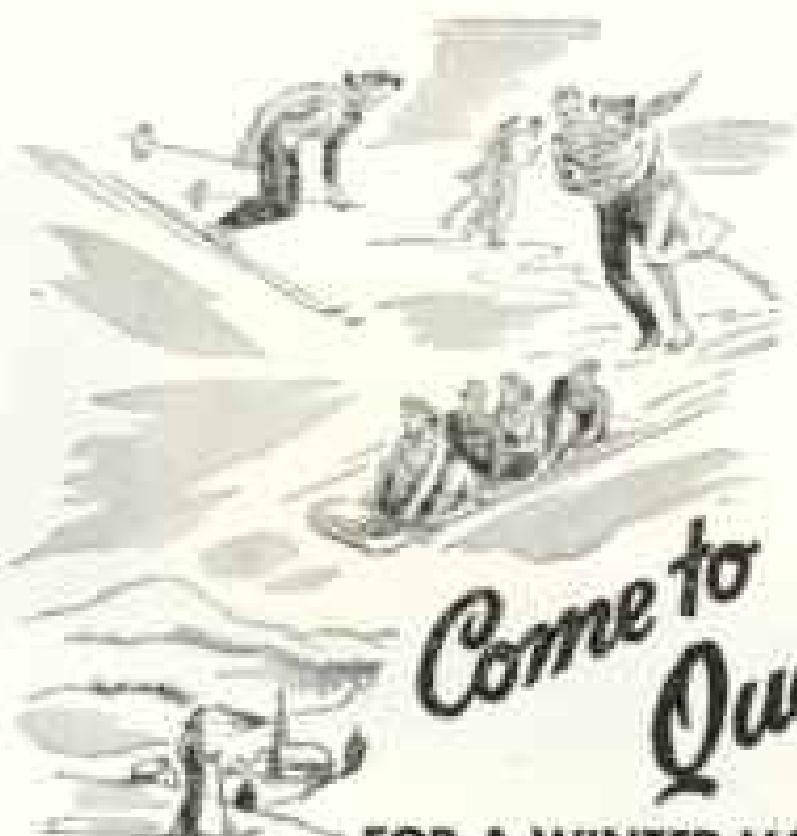
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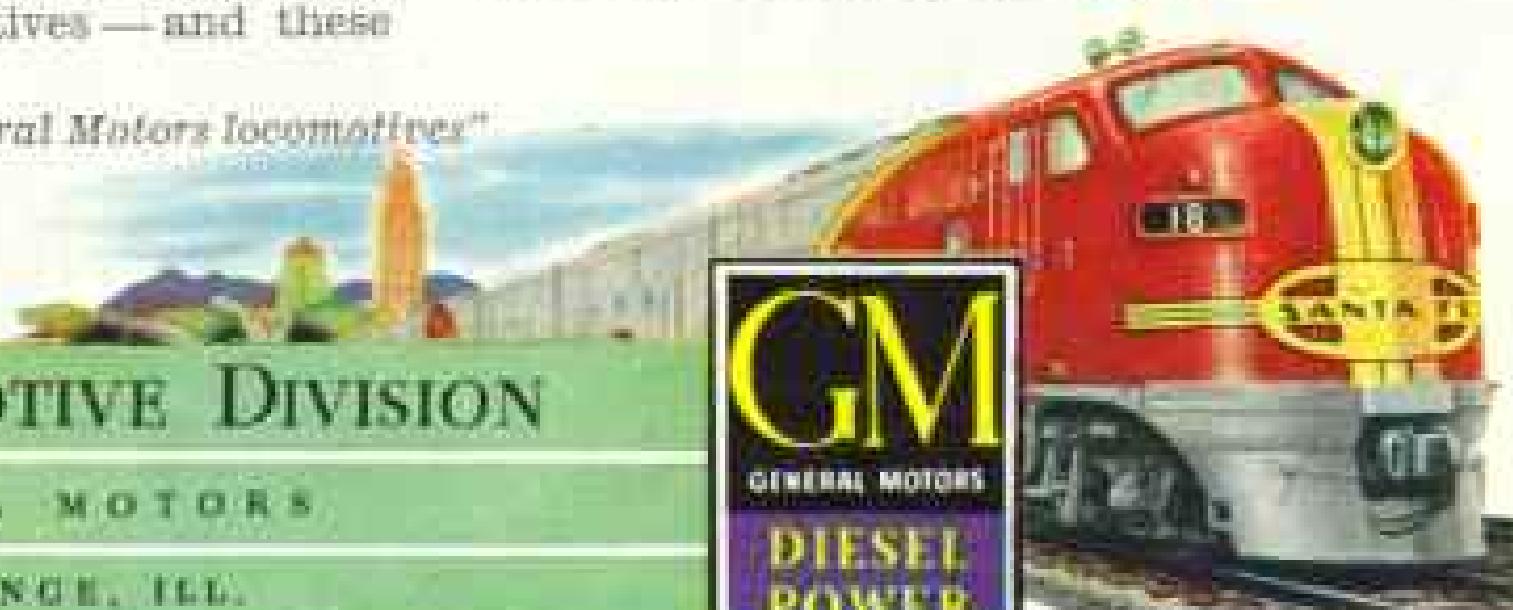
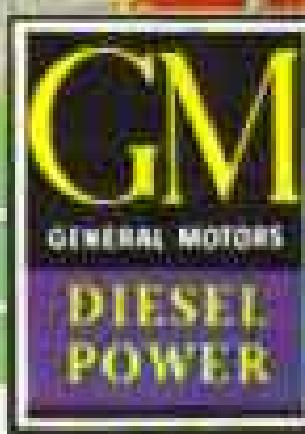
Don't think for a moment, however, that progress stops here. Good railroading is a series of never-ending developments. You can look to the railroads for even finer trains in the future—and to General Motors for even better locomotives to head the better trains of tomorrow.

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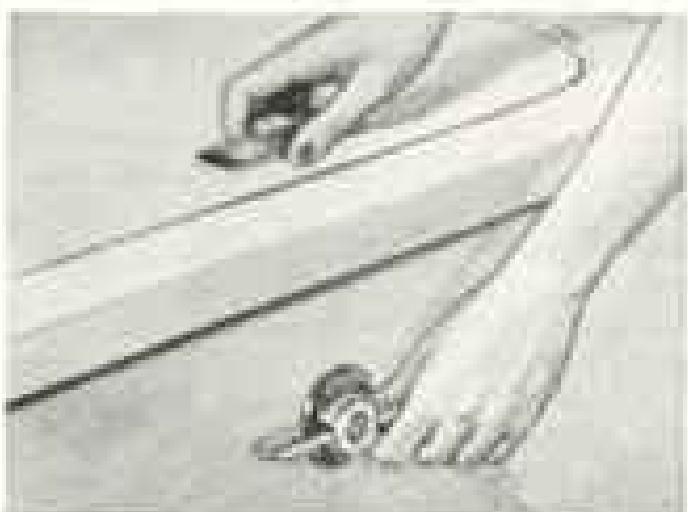
I can do this—and the dishes at the same time!



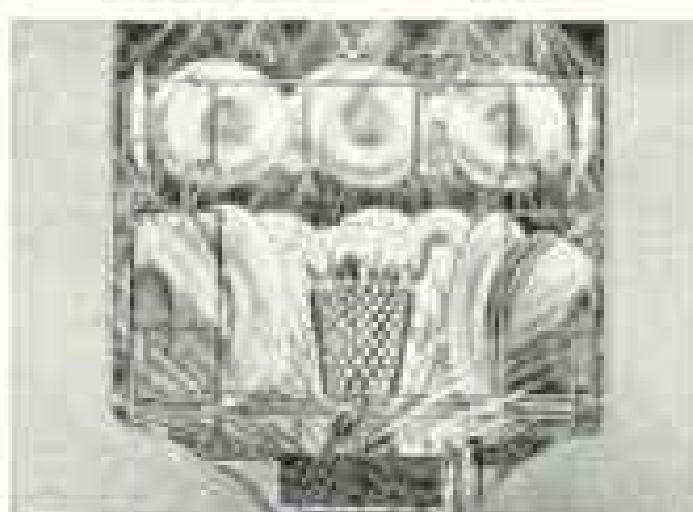
Wonderful new General Electric Dishwasher washes dishes sparkling clean automatically. They dry in their own heat!



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2. Now add detergent (not soap), close cover and turn switch. Dishwasher is now at work, scouring each piece shining clean. Your job is done; you're free to do whatever you wish.



3. While you do as you like, each piece is thoroughly cleaned and scoured by the hot water and detergent. Only the water moves—not the dishes. They stay firmly in the racks. Then . . .



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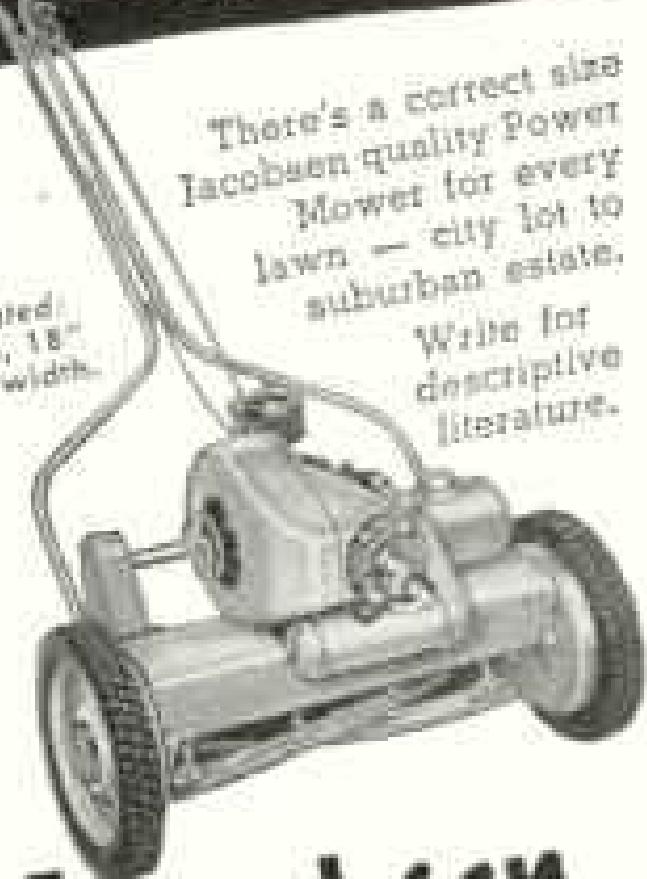
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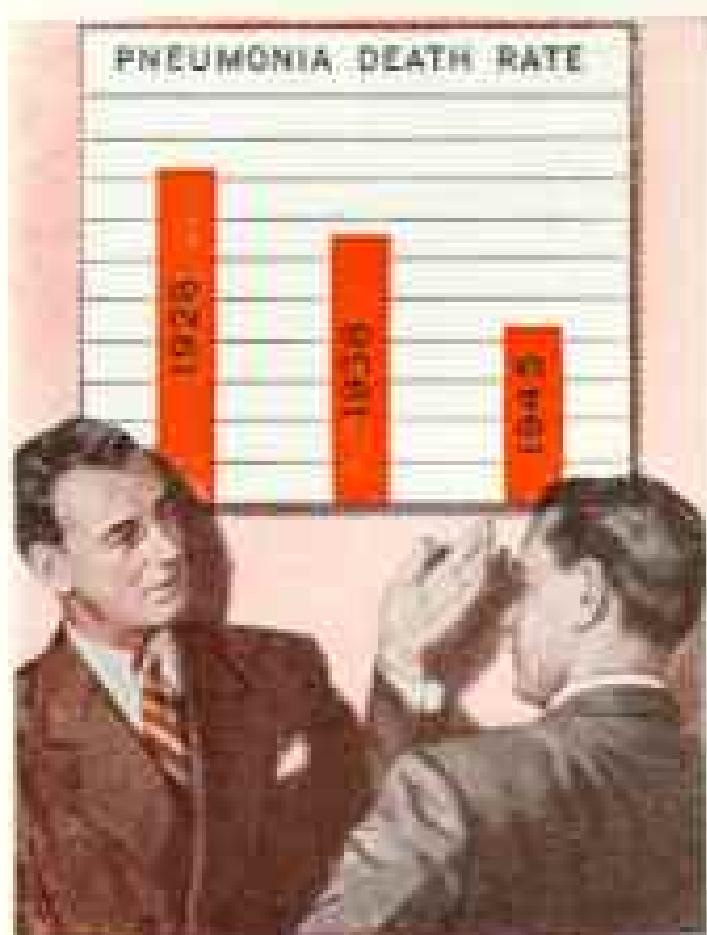
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PNEUMONIA IS BEING CONQUERED

WHAT SCIENCE IS DOING



1. Before 1930, pneumonia stood among the first three causes of death. Once the disease struck, careful nursing and the use of oxygen were about the only ways of fighting it. The death rate was about 83 per 100,000.

2. From 1930 to 1938, serum treatment was started and developed. This involved, first, laboratory analysis to determine the particular type of disease and, second, administering a serum known to combat the disease if it were one of certain types. Pneumonia's death rate dropped, and in 1938 was about 67 per 100,000.

3. From 1938 on, modern medical science has scored one of its most dramatic successes. First the sulfa drugs, then penicillin and streptomycin have proved effective in combatting many types of pneumonia. While the death rate from pneumonia had been reduced to less than 40 per 100,000 in 1946, this disease is still a frequent cause of death.

WHAT YOU CAN DO

1. Try to avoid catching a cold. If you keep your general level of health high, especially during the "pneumonia months" of January, February, and March, you won't be as susceptible to colds or pneumonia.

Be careful to dress warmly when you go out, and try to avoid people who cough or sneeze carelessly. It is estimated that 9 out of 10 pneumonia cases start with a cold.

2. If you get a cold—take care of it! You will protect yourself from possible pneumonia, and you'll protect others from your infection. Stay home and rest if you can.

If you must go out, keep warm and dry. Eat lightly, and drink plenty of fruit juices and other liquids. When your children have colds, keep them at home to protect their health and that of their classmates.

3. If your cold hangs on, or if your temperature goes up, or if any other unusual symptoms appear, go to bed and call your doctor at once!

It may be only a severe cold, but if it should be pneumonia, or influenza, or some other illness that starts like a cold, your best chance for a rapid recovery will come from prompt diagnosis and immediate medical and nursing care.

To learn more about how you can guard against colds, pneumonia, and influenza, send for Metropolitan's free booklet N-18, "Respiratory Diseases."

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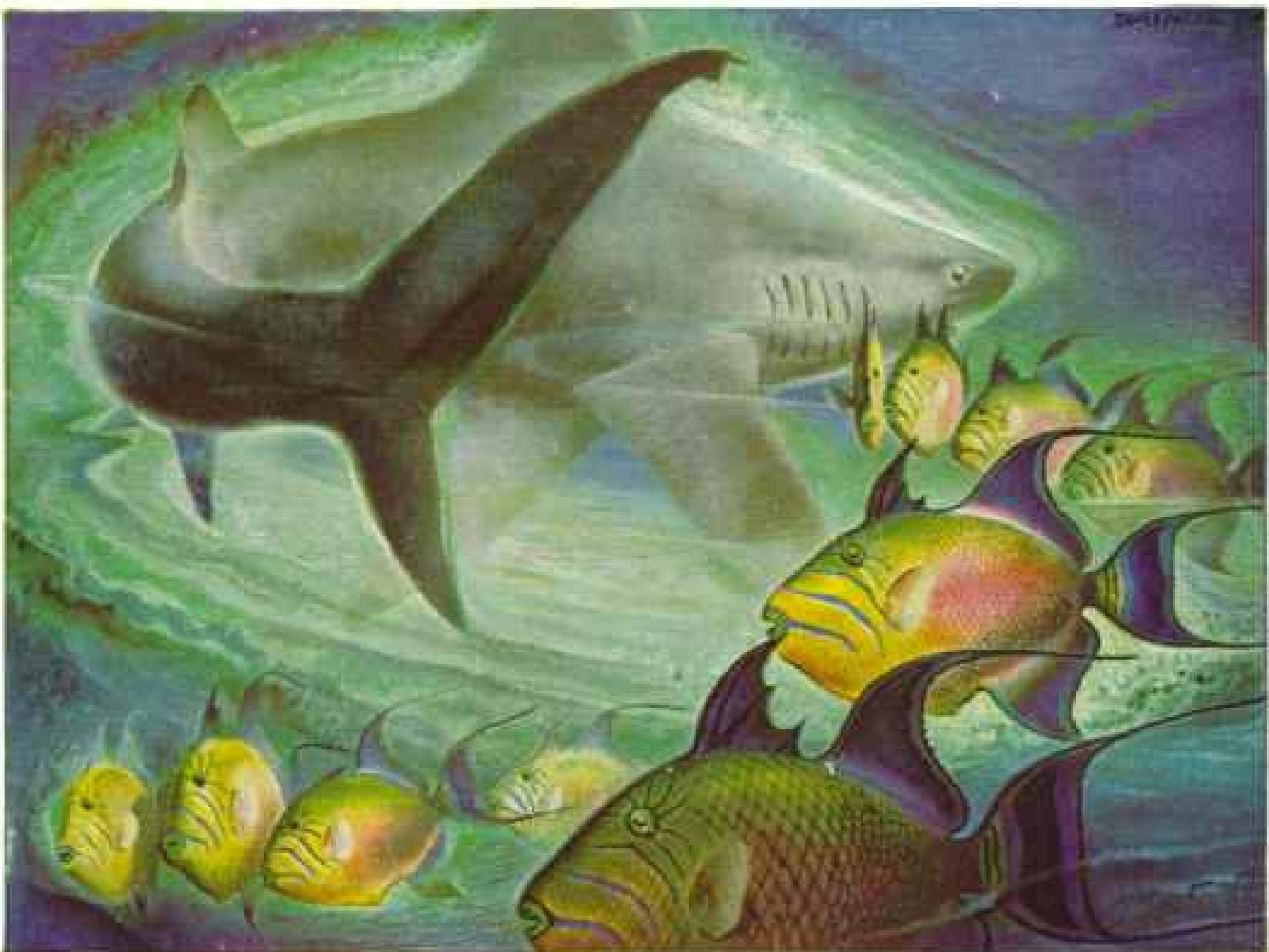
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TO VETERANS—IF YOU HAVE NATIONAL SERVICE LIFE INSURANCE—KEEP IT!



Why Balistes gets a lettin' alone

THE Caribbean trigger fish (*Balistes vetula*) would end up in the stomach of a shark far oftener than he does, except for one thing.

Instead of a dorsal fin, Balistes has a heavy, sharp spine just behind his head. Normally this spine lies in a shallow groove along the back.

But when Balistes sees a shark or other large predatory fish coming his way, his sharp spine pops up and is locked in place. His enemies then recognize Balistes as a fish hard to swallow or, at best, a pain in the gullet. And they leave him alone.

Man has gone Balistes and nature one better. Not only has he developed countless weapons to fend off trouble, he has even figured out a device to keep unavoidable mishaps from costing him a lot of money and worry.

The name of that device is insurance. Think of the worries that insurance saves you.

An accident may lay you up. But if you have accident insurance, you won't have to dip into savings to pay your bills while you're not earning.

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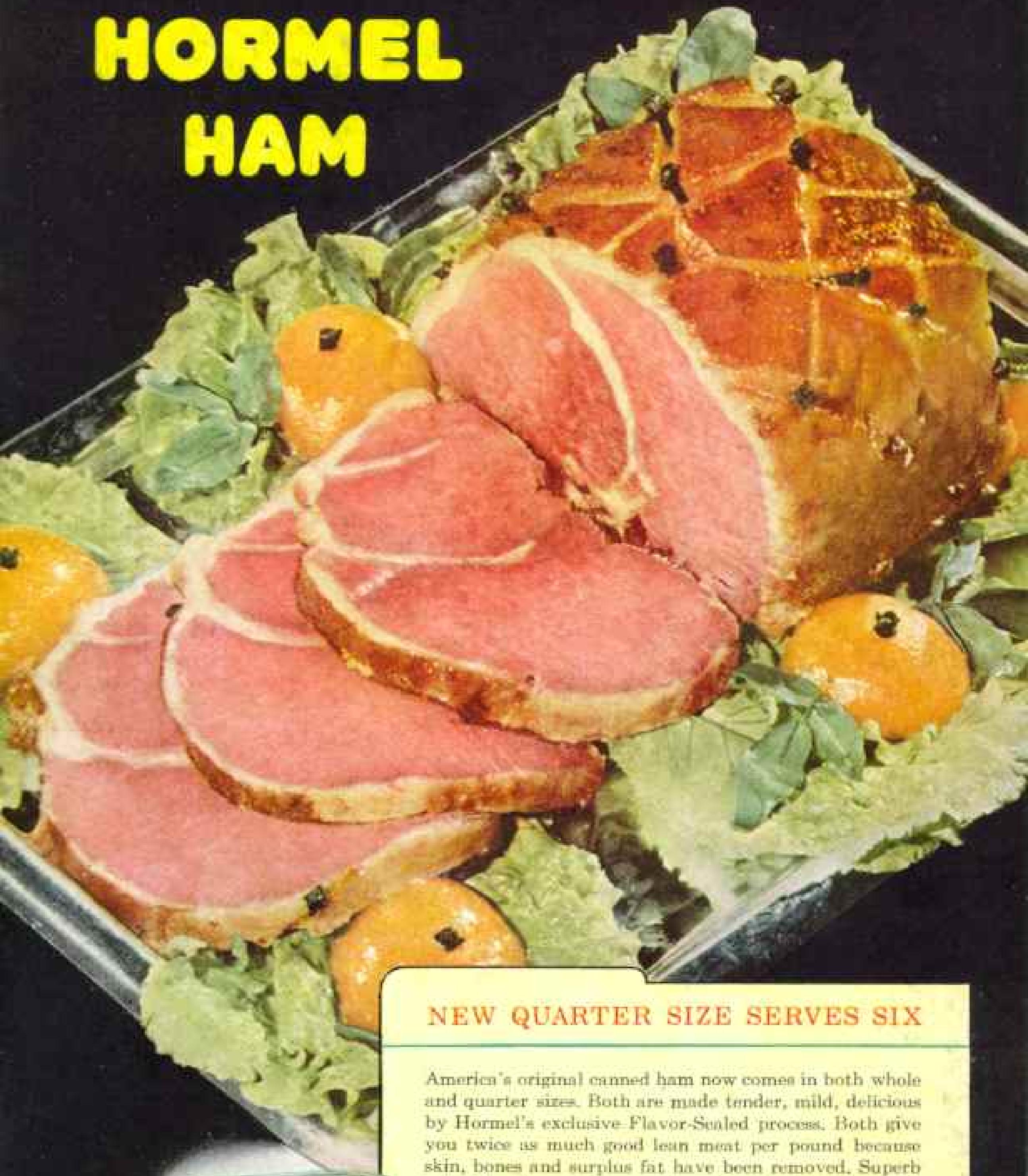
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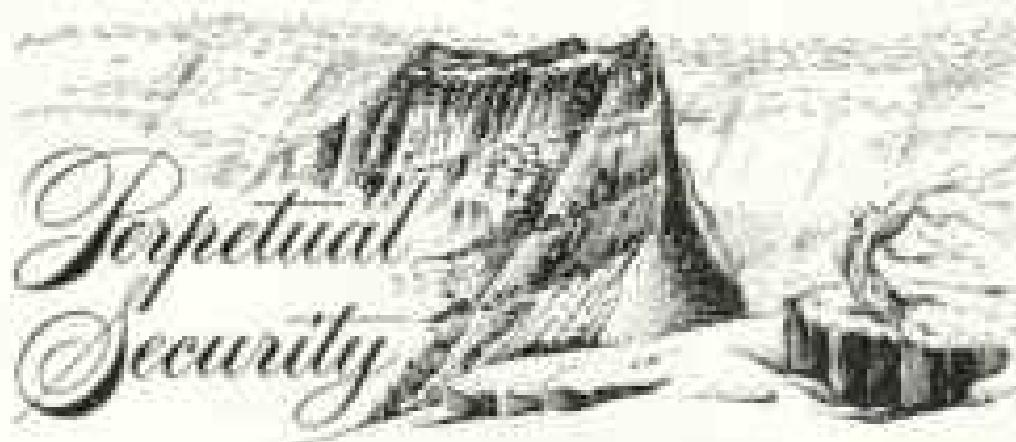
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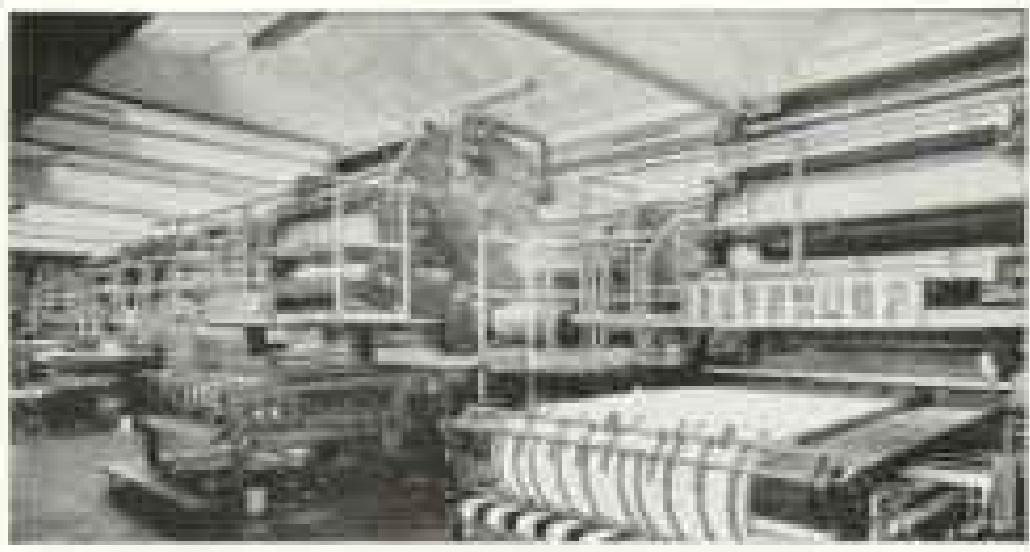
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